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Diploma Thesis: "Research on New Technologies of Information Systems for Adaptive Social Protection Applications"

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Everyone has a plan 'till they get punched in the mouth.
Mike Tyson

If you don't know where you are going, you might wind up someplace else.
Yogi Berra

When you ask people, What's the opposite of fragile? They tend to say robust, resilient, adaptable, solid, strong. That's not it. The opposite of fragile is something that gains from disorder.
Nassim Nicolas Taleb

Αντί προλόγου

Το πεδίο της Προσαρμοστικής Κοινωνικής Προστασίας (Adaptive Social Protection) είναι ένα φαινόμενο των καιρών. Αφενός γιατί οι καταστροφές και τα σοκ είναι πιο συχνά από ποτέ (ή ακόμη και πιο εμφανή), αφετέρου γιατί οι τεχνολογίες πληροφορικής που υπάρχουν σήμερα μπορούν να εξυπηρετήσουν (έως ένα βαθμό) τις αναδυόμενες συνεχώς καταστάσεις σοκ, βρίσκοντας ένα νέο πεδίο εφαρμογής, ας μην το κρύβουμε, και πειραματισμού. Ίσως ακόμη και γιατί εκείνοι που θα έχουν ανάγκη πληθαίνουν σωρευτικά. Η ορολογία είναι αμφίβολο εάν υπάρχει στην ελληνική γλώσσα και μάλλον θα δοκιμάσει πολλούς όρους μέχρι να καταλήξει σε έναν τελικό και (ως συνήθως) πάλι αδόκιμο όρο. Οι τεχνολογίες της πληροφορικής είναι βέβαιο ότι θα διαδραματίσουν ισχυρό ρόλο στην εγκαθίδρυση του τομέα αυτού μιας και η προσαρμοστική κοινωνική προστασία πρέπει να έχει πλεονέκτημα χρόνου και να ελαχιστοποιεί τη γεωγραφική απόσταση, κάτι που αντιλαμβανόμαστε καθημερινά όλοι οι χρήστες. Επιπλέον, πρέπει να οδηγήσει στην κανονική ζωή (ίσως και σε μια λίγο καλύτερη) εκείνους που βίωσαν το σοκ και επιπλέον να κάνει τη μετάβαση όσο πιο ομαλή γίνεται. Τα προβλήματα λοιπόν που προσεγγίζει η προσαρμοστική κοινωνική προστασία είναι προβλήματα μηχανικής που όμως εμπεριέχουν άτομα και ομάδες υπό συνθήκες στρες. Και η αλήθεια είναι ότι ξεκινάει πολύ πριν την εμφάνιση του σοκ και δεν τελειώνει λίγο ή αρκετά μετά από αυτό. Ένα μεγάλο μέρος της αφορά την ιδιαίτερη τέχνη απόκτησης και χρησιμοποίησης των κατάλληλων και επί τούτου δεδομένων κάτι όχι ιδιαίτερα συχνά εφικτό. Η δυναμική φύση αυτών των δεδομένων αναδεικνύει ένα ακόμη δύσκολο έργο, την ποιοτική ενημέρωση τους αλλά και τη διαπίστωση της απαξίας τους σε ένα νέο διαφορετικό πλαίσιο. Τα θύματα, που ενδεχομένως δεν είναι μόνο εκείνα που επηρεάστηκαν άμεσα από το σοκ, μιας και μορφές ανθρώπινων πρακτικών που παίρνουν πλεονέκτημα από την καταστροφή επιτείνουν τη γενική εικόνα, κρύβονται πολλές φορές πίσω από στερεότυπα και γενικεύσεις. Οι αποφάσεις για την παροχή βοήθειας δεν μπορούν παρά να είναι εξειδικευμένες για την κάθε περίπτωση, ακόμη κι αν σε περιοχές με επαναλαμβανόμενα σοκ μπορούν σε κάποιο βαθμό να ορίζονται εκ των προτέρων, κι εκεί όμως η δυναμική φύση των δεδομένων για χρήση, ζητά επανασχεδιασμό και ενημέρωση. Η πρακτική της βοήθειας επιπλέον, προσομοιάζει με ένα supply chain που μπορεί να δανείζεται στοιχεία από τον κόσμο των επιχειρήσεων, έχει όμως τα δικά του ιδιαίτερα και επιτακτικά χαρακτηριστικά. Στην γραμμή της αλυσίδας αυτής δεν θα μπορούσε να λείπει η βοήθεια με την ανταλλακτική μορφή του χρήματος αφού δεν υπάρχουν προς το παρόν άμεσα και μαζικά εφαρμόσιμες εναλλακτικές. Το χρήμα βέβαια δεν είναι απαραίτητο να έχει

υλική υπόσταση και έτσι ο τομέας της προσαρμοστικής κοινωνικής προστασίας υιοθετεί πρακτικές και μεθόδους ψηφιακών συναλλαγών, χωρίς πάντα ιδιαίτερη επιτυχία. Η καταλυτική σημασία των υποδομών που πρέπει να υποστηρίξουν όλη αυτή τη διαδικασία δεν πρέπει να αγνοείται και θα πρέπει να δοθεί έμφαση ώστε το τελευταίο μίλι, εκείνο που θα σημάνει και την σύνδεση με τον αποδέκτη, να είναι εφικτό. Οι τεχνολογίες της πληροφορικής, από τις υποδομές έως τις υπηρεσίες μέσω λογισμικού, είναι φανερό πως πρέπει και αυτές να προσαρμοστούν σε έναν κόσμο που έχει γεμίσει από μαύρους κύκνους.

Ευχαριστώ τον καθηγητή Γιάννη Τζήμα που μου πρότεινε ένα σύγχρονο και με αναπόφευκτες προοπτικές θέμα. Η προσωπική του ενασχόληση με το θέμα θεωρώ πως του έχει αναδείξει πόσο ιδιαίτερο και περίπλοκο είναι το πεδίο της προσαρμοστικής κοινωνικής προστασίας, κάτι που μου μετέδωσε στις ποιοτικές συνομιλίες που είχαμε κατά τη διάρκεια της συγγραφής.

Ακόμη, θέλω να εκφράσω την ευγνωμοσύνη μου για την κατανόηση που έδειξε στην καθυστέρηση παράδοσής της, καθώς υποδυόμουν τον Houdini για μεγάλα χρονικά διαστήματα, χωρίς όμως να επανεμφανίζομαι όπως εκείνος. Με τον καθηγητή Γιάννη Τζήμα θα μπορούσαμε να κάνουμε ένα διαγωνισμό για το ποιος κάνει περισσότερα πράγματα ταυτόχρονα, θα με νικούσε βέβαια στο ποιος τα ολοκληρώνει.

Ευχαριστώ επίσης, τα μέλη της τριμελούς επιτροπής εξέτασης, Δρ. Ιωάννη Τσακνάκη και Δρ. Παναγιώτη Ζέρβα για την κριτική και τη βαθμολόγηση της εργασίας μου.

Τέλος, ευχαριστώ την οικογένεια μου Έρικα, Έκτορα και Μαίρη που δημιουργούν τον απαραίτητο σκοπό και αφήνουν σε μένα τα υπόλοιπα.

Contents

List of Abbreviations / Acronyms

AI	Artificial Intelligence
API	Application Programming Interface
ASP	Adaptive Social Protection
BBB	Build Back Better
BISP	Benazir Income Support Program (Pakistan)
BOMS	Beneficiary Operations Management System
BOP	Balance of Payments
BPMN	Business Process Model and Notation
CBDC	Central Bank Digital Currencies
CBT	Community-Based Targeting
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CCT	Conditional Cash Transfers
CVA	Cash and Voucher Assistance
DaLA	Damage and Loss Assessment
DRM	Digital Rights Management
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EGDI	E-Government Development Index
EM/DAT	Emergency Events Database
EPI	E-Participation Index
ESO	Employment Service Office
EU	European Union
EWS	Early Warning Systems
G2P	Government-to-Person
GCI	Global Cybersecurity Index
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation
GPS	Global Positioning System
GRM	Grievance Redress Mechanisms
G2P	Government to Person
HCD	Human-Centered Design
HCI	Human Capital Index
HDI	Human Development Index
HEA	Household Economy Approach
HMT	Hybrid Means Testing
HRNA	Human Recovery Needs Assessment
HSNP	Hunger and Safety Net Program (Kenya)
ICCPR	International Covenant on Civil and Political Rights
ICCPR	International Covenant on Civil and Political Rights

ICT	Information and Communication Technology
IDSPS	Integrated and Digital Social Protection Information Systems
IFI	Institutional Framework Index
IFI	International Financial Institutions
IFRC	International Federation of Red Cross and Red Crescent Societies
ILO	International Labor Organization
IM	Information Management
IMS	Information Management Specialist
IoT	Internet of Things
IRC	International Rescue Committee
IRP	International Recovery Platform
ITU	International Telecommunication Union
IVACC	Index of Vulnerability to Climate Shocks
LOSI	Local Online Service Index
MCR 2030	Making Cities Resilient 2030
MDG	Millennium Development Goals
MHEWS	Multi-Hazard EWS
MoU	Momentum of Understanding
MT	Means Testing
MVAC	Malawi Humanitarian Aid
NDIA	National Disability Insurance Agency (Australia)
NGO	Non-Government Organization
NLP	Natural Language Processing
NSER	National Socioeconomic Register (Pakistan)
OCHA	Office for the Coordination of Humanitarian Affairs
OECD	Organization for Economic Co-operation and Development
OSI	Online Services Index
PCRAFI	Pacific Catastrophe Risk Assessment and Financing Initiative (Pacific Island)
PDNA	Post-Disaster Needs Assessment
PFD	Process Flow Diagram
PMT	Proxy Means Testing
PRSP	Poverty Reduction Strategy Paper
PSNP	Productive Safety Net Program (Ethiopia)
PSSB	Basic Social Security Program (Mozambique)
P2P	Peer to Peer
RFM	Risk-Financing Mechanism
SDG	Sustainable Development Goals
SIoT	Social Internet of Things
SIUBEN	Sistema Unico de Beneficiarios (Dominican Republic)

SMS	Short Message Service
SoS	Survey of Surveys
SP	Social Protection
SPI	Service Provision Index
SPIS	Social Protection Information Systems
SSO	Social Service Office
TECI	Technology Index
TII	Telecommunication Infrastructure Index
ToR	Terms of Reference
UA	Unemployment Assistance
UBR	Unified Beneficiary Registry
UDHR	Universal Declaration of Human Rights
UML	Unified Modeling Language
UN	United Nations
UNCDF	United Nations Capital Development Fund
UNDAF	UN Development Assistance Framework
UNDG	United Nations Development Group
UNDRR	United Nations Office for Disaster Risk Reduction
WB	World Bank

List of Figures, Tables, and Charts

Περίληψη

Η εργασία αυτή αναφέρεται στην ενσωμάτωση τεχνολογιών πληροφορικής στον τομέα της Προσαρμοστικής Κοινωνικής Προστασίας (Adaptive Social Protection) που σχετίζεται με την αλυσίδα παράδοσης μετά από συμβάντα σοκ. Η αλυσίδα αυτή περιλαμβάνει τη συλλογή και χρήση δεδομένων από ήδη υπάρχουσες βάσεις δεδομένων κοινωνικής προστασίας, τη συνεργασία φορέων κρατικών και μη και την εμπλοκή χρηματοπιστωτικών ιδρυμάτων για την παροχή οικονομικής βοήθειας. Παρουσιάζονται οι αρχές και τα κύρια χαρακτηριστικά των συστημάτων προσαρμοστικής κοινωνικής προστασίας καθώς και ζητήματα που σχετίζονται με τη λειτουργία της όπως τα δεδομένα που συλλέγονται και χρησιμοποιούνται, οι δομές αποθήκευσης και ζητήματα ασφάλειας και ιδιωτικότητας που προκύπτουν. Αναφέρονται και αναλύονται υποδομές και εργαλεία καθώς και διακριτοί τρόποι προσέγγισης. Επιπλέον, παρουσιάζονται και προτείνονται τρόποι οργάνωσης και χρήσης νέων τεχνολογιών πληροφορικής που θα μπορούσαν να υιοθετηθούν για να καταστούν τα συστήματα αυτά ολοκληρωμένα και δια-λειτουργικά.

Abstract

This study explores the incorporation of Information Technology (IT) into the realm of Adaptive Social Protection, focusing specifically on the post-shock delivery chain. This chain includes the gathering and utilizing of data from existing social protection databases, collaboration between governmental and non-governmental entities, and the engagement of financial institutions to facilitate financial aid. The study outlines the fundamental principles and key features of adaptive social protection systems, presenting operational aspects such as data collection, storage structures, and attendant security and privacy concerns. Infrastructures, tools, and different approaches are being discussed and analyzed. Additionally, the study examines strategies for organizing and leveraging emerging IT technologies to foster integration and interoperability within these systems and proposes recommendations for implementation.

Keywords

Adaptive Social Protection, Social Protection, Social Protection Information Systems, e-government, Integrated Social Protection Information Systems

Section 1.0. Social Protection Registries

There is increasing global awareness of social protection programs and their integration into social protection information systems, as events that in the past could be characterized as rare, such as earthquakes, floods, pandemics, and climate change consequences, are becoming more frequent and affect a larger population (Figure 1 and Figure 2). A starting point for Social Protection Information Systems is a component called "registry." A registry is a database with digital records of households or individuals. The term "household" here is used instead of the term "family" to point out the fact that in many places worldwide, a house and its occupants are regarded as a unit, a set of individuals living together under the same roof, due to poor economic conditions, despite any possible kinship. Other authors (Lindert et al.,2020) incorporate the terms individuals, family, and households under the general term "people;" however, describing the core actors in social protection programs with one term remains challenging. These records may contain information on socioeconomic status, household members, range of income, etc. (AusAID2012). This information can be shared across governments and other stakeholders using software applications, becoming an integrated "information system" (Barca,2017).

Figure 1. The annual average number of affected by disaster type for the period 2001-2020 (in millions) (Source: UNDRR.org)

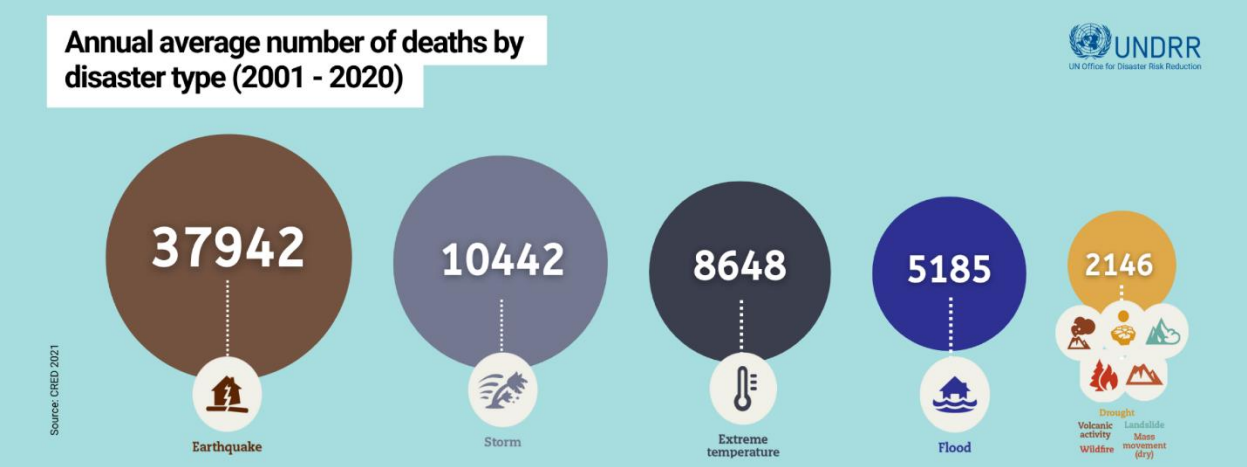
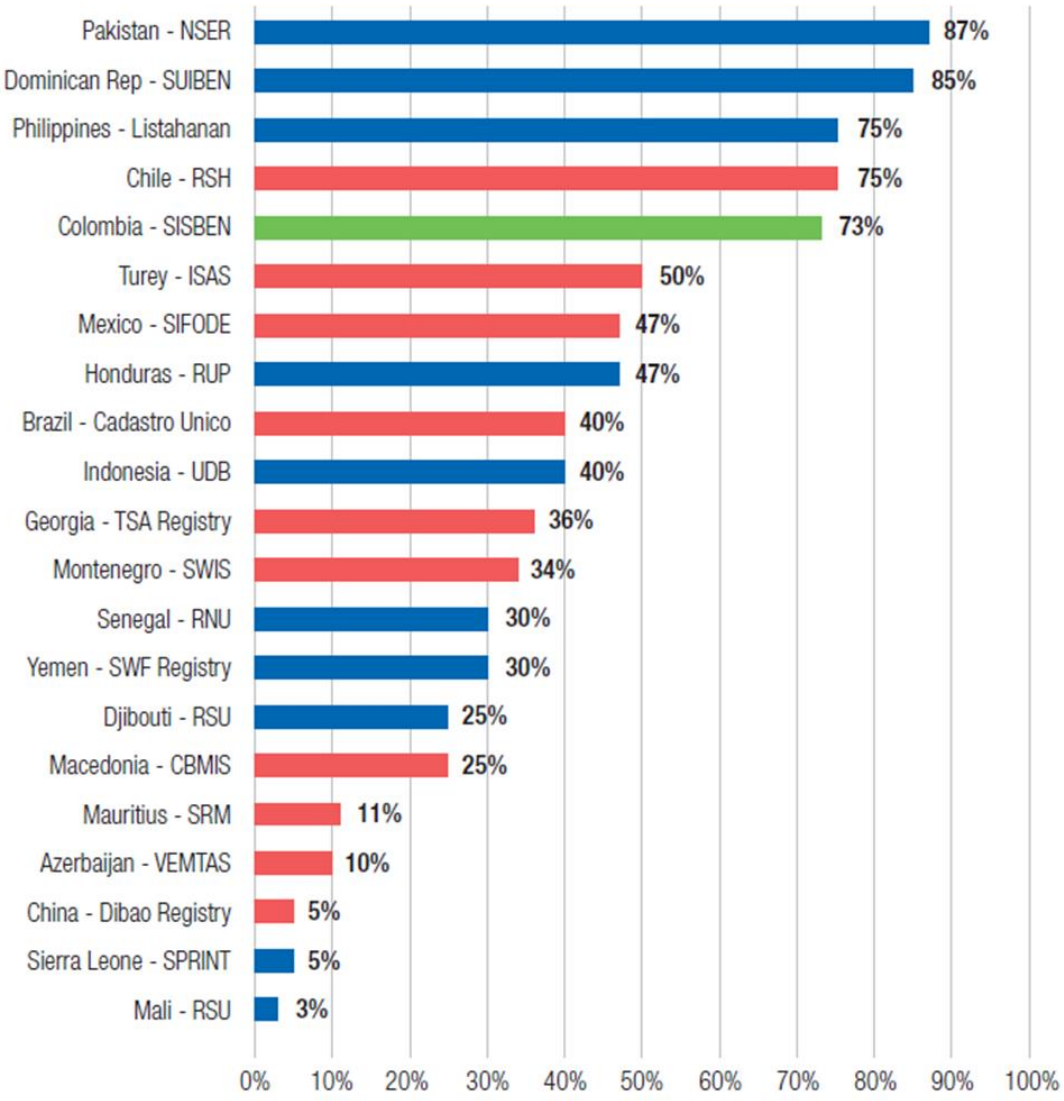


Figure 2. Annual average number of deaths by disaster type for the period 2001-2020 (Source: UNDRR.org)

According to Barca (2017) and Leite et al. (2017), the social protection sector has four primary overlapping registries. The first distinction is whether registries retain data on potential beneficiaries (Azevedo,2011), and the second is whether they serve one or multiple programs (Baldeon & Arribas-Banos,2008; Leite et al.,2017). However, Lindert et al. (2020) described a distinction between registrants and beneficiaries because not all registrants will become beneficiaries. Beneficiary identification is the process of eligibility rather than a specific person through standard practices (e.g., IDs). In some cases, for example, when the eligible individual is a child, the intended beneficiary may be a parent or guardian who receives an allowance on behalf of a child, defined as a "designated recipient" by Lindert et al. (2020). Beneficiary registries contain information on individuals and households enrolled in specific programs. This information can be extensive, including data on beneficiaries, such as household details, ID, age, sex, payment history, type and number of benefits, and registry enrollment history (Williams & Moreira,2020). Beneficiary registries support critical processes, such as enrollment, onboarding, provision of services and benefits, grievance history and resolution, and many more functions (Williams & Moreira,2020), to ensure the outcomes and overall performance of the programs at the first level. Moreover, when beneficiary registries are used for multiple programs, gaps, and duplicates can be found because different programs use different pathways, but most of the time, the same beneficiaries. Social registries serving multiple programs are the most common worldwide, although there is neither a standardized type nor a widely approved classification of social registries. Combinations and significant variations in previous distinct types can also be found. However, the functionality of social registries arises when they are combined with different data

sources and integrated into larger modules, referred to as “information systems.” They can then serve various approaches and applications, such as assessing the demand for social programs, monitoring and coordinating the “supply” of social programs, and supporting the planning, design, and delivery of assistance (Leite et al.,2017). Social registries are distinct from civil or population registries in that, in most cases, they contain much more detailed social, economic, demographic, and household data than civil registry systems (Williams & Moreira,2020). The need to set up a social protection registry (and its further incorporation into an information system) depends on a comprehensive list of reasons, which cannot be standardized worldwide (perhaps not even for different regions of the same country), as many parameters contribute to this. Many core queries lead to different setups and models of social registries and information systems when there is a need for decision-making on social protection. The information that needs to be considered includes the percentage of the population or geographical areas covered, the type of data collected and stored, how these data is collected and updated, the willingness to integrate the data into larger information systems, how the data is validated, stored, and maintained, data governance responsibilities, the level of privacy and security and data sharing policies (Barca & Beazley,2019). It is also important to take into account the financial constraints of the design approach as it impacts every point of investment in the delivery chain. This is particularly challenging because multiple stakeholders are involved in the process, and the dependencies are complex.

Chart 1. Social Registry Coverage Across Selected Countries



Source: Leite et al. (2017) (World Bank); Administrative Data for Honduras (2019). The chart demonstrates coverage as a percentage of the population included in the social registry (circa 2015-2018). Countries in red are primarily on-demand systems for intake, while those in blue carry out en-masse registration through census or survey sweeps. Colombia (green) used a combined approach.

Section 1.1. Program Delivery of Social Protection Registries

The program delivery of social protection registries mainly supports the delivery processes of outreach, intake, registration, assessment, and eligibility determination, providing enrolled beneficiaries with the intervention and management of data to ensure that the information is accurate and updated (Lindert et al., 2020; Williams & Moreira,2020). These processes are also covered under the term "delivery systems," which is the operating environment for implementing social protection services and benefits (Lindert et al.,2020). However, although these phases are typical among social protection delivery systems, the order and intensity of each may vary based on the aspects of the program. Moreover, when social protection registries are used for multiple programs, they help to avoid redundant applications from individuals/households for the same information. Integrated social protection registries can also provide more functional coordination across different programs and, in some countries, energy subsidies, health, education, and housing benefits (Williams & Moreira,2020).

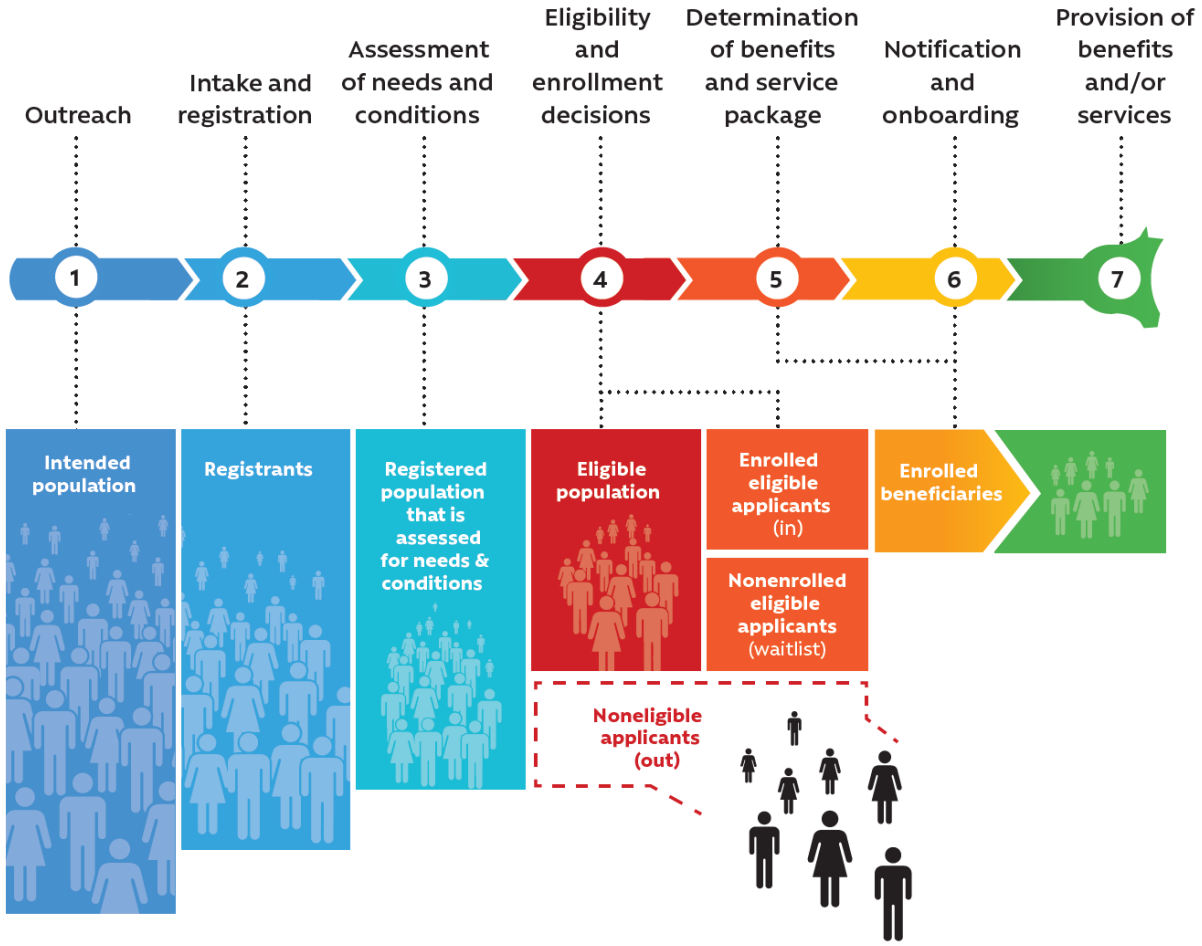


Figure 3. Population Reference Groups along the Social Protection Delivery Chain (Source: Lindert et al., 2020)

The way social protection registries are populated is also of interest and can exist in dynamic or static forms. As a dynamic form, it can be considered an "on-demand" application process where individuals/households present themselves and apply for inclusion in the registry without restriction on when they can apply (Williams & Moreira,2020). On the other hand, a static form can be populated through static census, for example, a survey of geographic areas, probably those with high rates of poor populations, at set periodic intervals. When this happens, updates are implemented at the start of each interval, and much information is hidden and unknown. There are several trade-offs in populating social protection registries using either approach. When a census approach is adopted, there is high coverage; however, the cost is high, and the system is not frequently updated. Conversely, dynamic approaches are less costly but demonstrate lower coverage (Williams & Moreira,2020; see Chart1). Developing social protection registries is a

lengthy process that includes arrangements, management, and decisions. It should be acknowledged that no single model can fit every country's needs (Williams & Moreira,2020). Social protection programs' benefits and services delivery chain can include government departments, non-governmental organizations, foundations, and private sector agents. These collaborations can extend across administrative levels (central, subnational, and local) and sectors as social protection programs frequently engage agencies and partners from various sectors (Lindert et al.,2020). Factors within the broader national context, such as the degree of decentralization, capabilities of local governments, and dynamics in both local and central politics, shape and limit the feasible choices for institutional arrangements in delivering social protection benefits and services. In addition, delivery systems and arrangements need to be developed dynamically. The subnational level of autonomy significantly influences the shaping of institutional arrangements for social protection. These arrangements inherently differ between countries with centralized and decentralized administrative structures (Lindert et al.,2020). For instance, while the social aspects of development fall under the central government's purview in Mexico, Brazil designates social welfare and poverty reduction as concurrent responsibilities across different governance levels. Additionally, variations in the pace of political, administrative, and financial decentralization can create complex challenges. When subnational entities operate independently of the implementation agency's direct hierarchical control in the delivery process, the challenge lies in encouraging cooperation and ensuring effective coordination during implementation. This condition is a significant constraint in the overall process. Selecting the most suitable institutional arrangements and incentive structures for the final delivery of tasks involves crucial considerations, such as task complexity, the ratio of field staff to beneficiaries and central-level staff, and the incorporation of technology (Lindert et al.,2020). This assessment is essential at the central and local levels and for contracted service providers, such as payment agents in cash transfer scenarios. It is also critical to differentiate between "static" elements, which remain fixed in the short run, and adjustable elements.

Section 1.2. The Role of Governments, Institutions, and Agencies in the Social Protection Delivery Chain

Institutions and agencies play several roles in the social protection delivery chain. First, policymaking refers to entities responsible for describing and establishing social protection policies and programs. Overseeing and managing the delivery chain in social protection programs also plays a critical role in the overall process. Moreover, for that part, the responsible entities should take care of day-to-day operations apart from synchronizing the entire delivery chain. The financing role is also a success factor in the broad process. Frequently, financing for social protection programs is a role held by central governments mainly because of their ability to raise funds through regular (or targeted) taxation, although in large and federal countries such as the USA, Canada, India, and Russia, subnational government financing (or co-financing) social protection programs. However, social protection systems and programs often lack comprehensive strategic vision and well-defined institutional structure, mainly because of their multisectoral responsibility dispersion (Lindert et al.,2020). Effective coordination, a significant challenge in social protection delivery systems, is primarily influenced by horizontal institutional arrangements. The distribution of roles and responsibilities across various ministries and agencies raises critical questions regarding the need for specific arrangements to facilitate coordination. Sometimes, a central ministry may hold a mandate encompassing policymaking, delivery, and inter-institutional coordination (Peru, Indonesia, Brazil, and the Philippines). In contrast, in other countries, social protection policymaking is the responsibility of a national multisectoral agency (Nepal). However, many cases occupy an intermediate position where multiple government agencies have been assigned distinct coordinated program plans and policies (Lindert et al.,2020). In any case, inefficient horizontal coordination leads to poor results. Social protection programs are typically organized by national governments aided by local governance entities during the implementation phase because of their geographical proximity to potential beneficiaries. This implies an additional level of awareness of the vertical coordination between local and central governments. However, as social protection systems evolve in a country, vertical coordination becomes more mature and adaptive to deliver services and benefits to the most vulnerable. Figure 4 depicts the main patterns of central-local vertical coordination arrangements for social protection delivery. The top level describes the case of a fully centralized implementation of a social

protection program with deconcentrated local offices that report directly to the central authority; the next level refers to the central-local partnership model in decentralized contexts, which applies in countries where local governments have greater autonomy for administrative functions and are capable of delivering social protection programs in some cases, including partial cost-sharing of administrative costs; the third model depicts the case in which subnational agencies can fully implement and manage specific social protection programs either with full central financing or with joint co-financing between central and subnational governments, usually through block or matching grants; and the last one is the fully decentralized model, where little or no interaction with the central government and management and implementation (even the financing) of the program remains at the local level (Lindert et al.,2020).

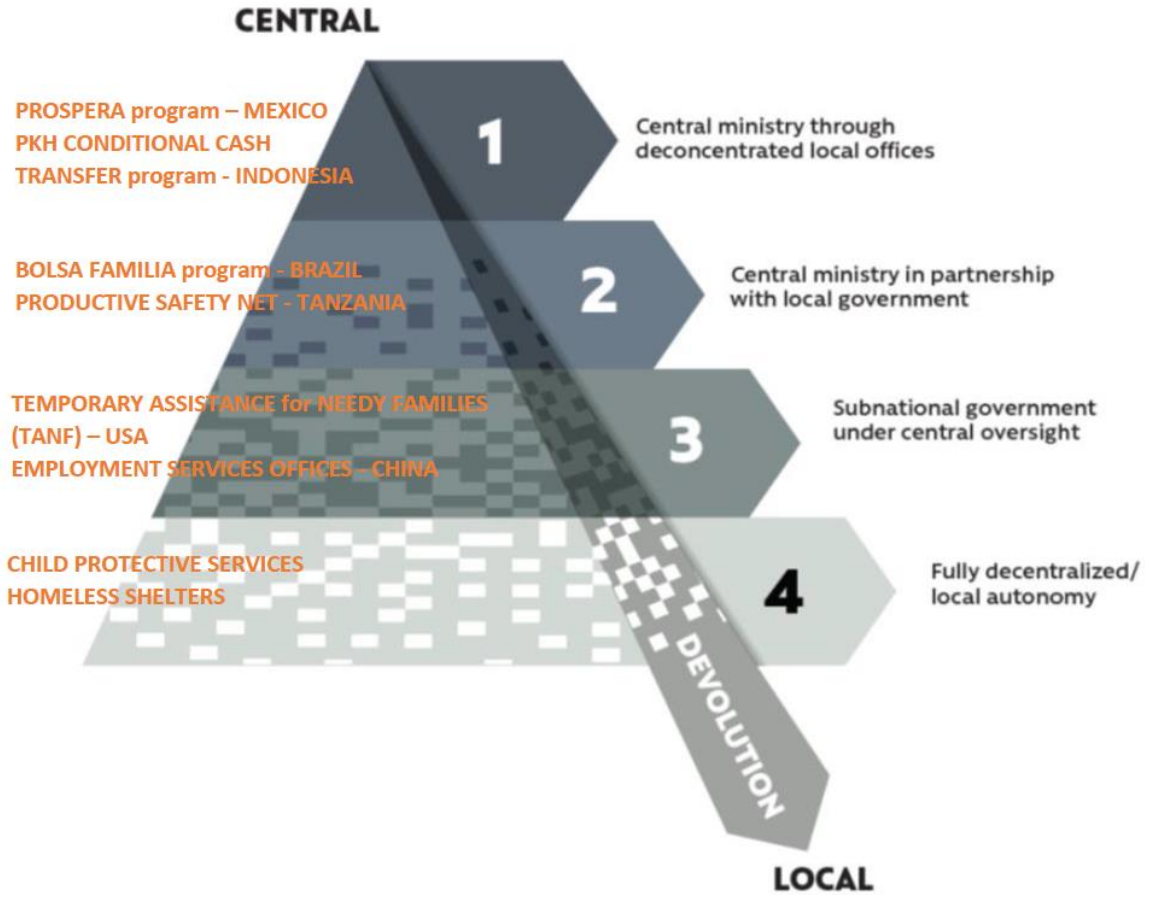


Figure 4. Main Patterns of Vertical Institutional Arrangements for Social Protection Delivery (Source: Lindert et al.,2020, adapted).

Additionally, outsourcing is a common practice, particularly in the provision phase of the social protection delivery chain (Lindert et al.,2020). Examples in which this practice is used include agents responsible for payment, such as banks, provision of labor and social services, and providers that have been approved by the government and have valid contracts, which can be paid by result (outcome-based) or can be paid by delivering specific services (output-based). Outsourcing necessitates significant managerial capabilities, both in initiating the contract and in its ongoing supervision.

Section 1.3. Delivery Chain Process Maps

An important tool for clarity and accountability in the social protection delivery chain and inherited by the business world is the so-called "Delivery Chain Process Maps" (Lindert et al.,2020). These charts show the delivery chain's sequence and the responsible actors. They are based on the "swim lane" diagrams and can be plotted end-to-end for the entire or part of the delivery chain. The maps help each responsible entity identify its role and ownership and the crucial connections between other social protection delivery chain actors. Delivery Chain Process Maps can be plotted and visualized based on the principles of the Business Process Model and Notation (BPMN), software design Unified Modeling Language (UML), and Process Flow Diagrams (PFDs). The standard symbols used in all these diagrams, combined with Delivery Chain Process Maps, can provide an easy-to-read visual representation of responsibilities in a process. The design of the steps in delivery chain process maps comprises the identifying of the actors, the roles, and responsibilities for each actor, the assignment of a "swim lane" to each actor (horizontal swim lanes with central actors on the top lane, then agencies and providers, then subnational and local and people at the last lane), the identification of the steps for implementation and the mapping of these steps for each actor. Moreover, critical questions regarding the necessity and efficiency of the designed processes should be answered, such as whether all the steps are necessary (Rummier & Brache,1990; Hammer & Champy,2003; Lindert & Karippacheril,2017;2018; Karippacheril et al.,2019; Lindert et al., 2020). An example of a delivery chain process map is the following (Figure 5), based on "Systems Modernization – Process Mapping for "Outreach, intake and Registration, assessment of Needs and Conditions and Eligibility Determination" from the Safety Nets Core course by George & Caillava, (2019).

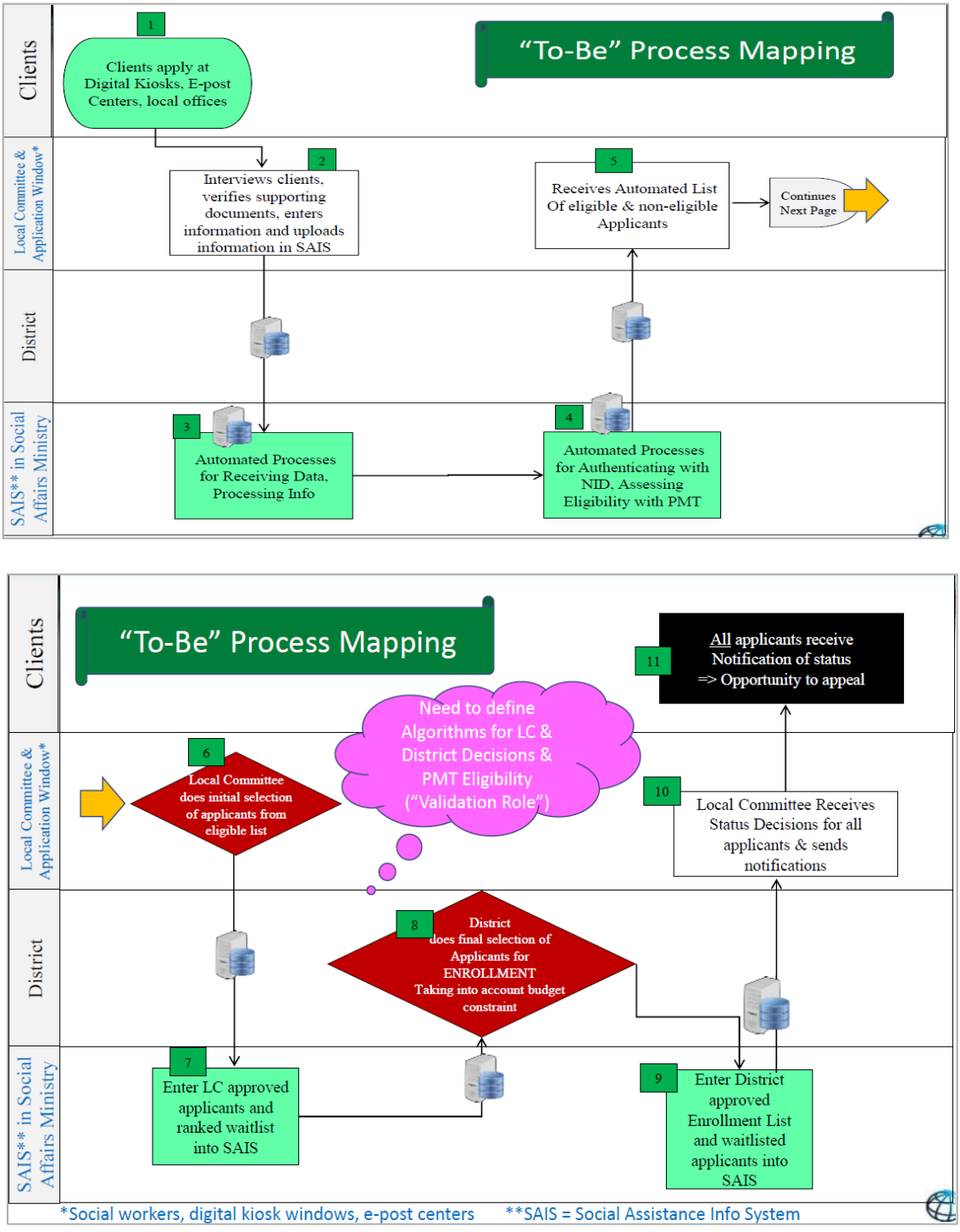


Figure 5. Delivery Chain Process Map for Outreach, Intake, and Registration, Assessment of Needs and Conditions, and eligibility determination (Source: George and Caillava, Safety Nets Core Course WB,2019)

Delivery chain process maps facilitate the identification of the functions and main actors in the last mile of the delivery chain. Lindert et al. (2020) used the term “client-facing functions”; however, the term client is more related to the business world rather than the social protection framework; thus, it is not adopted here. Local actors or outsourcing providers typically undertake these functions. Local or subnational actors are often better positioned than central agencies to perform these functions because of their proximity and potential familiarity with the client base. Subnational actors may include administrative branches of states, regions, or provinces, whereas local actors may encompass municipal administrative offices, local branches of central agencies, and mobile teams (Lindert et al.,2020). Additionally, last-mile functions can be outsourced to specialized providers such as foundations, non-governmental organizations, private contractors, payment agents, and specific service providers. Moreover, determining operational decisions along the delivery chain, including eligibility, enrollment or exclusion, benefits, and services, involves considering the actors responsible for such decisions. In many programs, these responsibilities are centralized, offering the advantage of ensuring standardized treatment nationwide, reducing political pressures on local actors, and limiting local discretion. Alternatively, some programs opt for decentralized decision-making by assigning these responsibilities to local actors. This decentralization allows for incorporating local conditions in decision-making but may introduce partiality due to increased local discretion (Lindert et al.,2020). Another critical function is managing supporting delivery platforms, particularly information systems, which vary in different countries. These systems are often centrally managed, even if the data are stored virtually (Turkey's Integrated Social Assistance System, Chile's Social Household Registry, integrated information systems, and social registries in Pakistan and the Philippines). Conversely, some countries lack a national system. For instance, the United States does not have a national system for managing social assistance, with each state being responsible for designing, procuring, and maintaining its own system (Lindert et al.,2020). Additionally, systems may be outsourced to operating agents, for instance, Brazil's Cadastro Único, managed by the social ministry but operated by a national federal bank, and Australia's Centrelink, which serves as both the managing agent and the operating system for all social protection benefits.

Section 1.4. Human Interactions with Social Protection Delivery Chain – Journey Maps

However, while it is important to implement the delivery chain for social protection on the central and institutional sides, the recipients' side is also critical for receiving support and benefits. People need to learn and know the available programs and processes, such as local and remote contact points, registration, decision-making regarding eligibility, enrollment and onboarding, personal updated status, available benefits, handling and interaction with relative applications, payment and service providers, timeline of the delivery, and available channels for grievances. The interactions between people and delivery can be physical, digital, or combined. The maturity level of this communication channel plays a critical role in achieving improved delivery chain services, and it determines the range in which the established social protection delivery will be implemented. Inadequate people-side configuration could reduce social protection delivery chain capacity and result in "pain points" for people through the system (Lindert et al.,2020). In this framework, for enhancing the "user experience," Lindert et al. (2020) suggest the use of human-centered design (HCD), highlighting the fact that most of the programs are designed with the average applicant in mind, while there is a high degree of diversification. This approach could lead to the development of more adaptive interventions.

An excellent example of an HCD is the journey map. Journey maps serve as concise visualizations of the entire individual experience, capturing the individual's journey in terms of expectations, behaviors, emotions (both positive and negative), and "pain points." These maps emphasize empathy from an individual's perspective, which may differ significantly from the administrative process viewpoint. Constructing journey maps involves techniques like "shadowing" individuals as they navigate the process of accessing social protection benefits or gathering insights through their firsthand accounts. Despite their potential complexity, journey maps need not be extensive exercises; even a brief description of individual experiences from initiation to conclusion can offer valuable insight. The basic components of a journey map include mapping out the primary activities, steps, and actions that individuals undertake throughout different phases and comprehending the diverse touchpoints or modalities through which individuals engage with the system. Moreover, journey maps imply monitoring of parameters like time, costs, and visits by recording the duration of each step, including the total elapsed calendar days from the "trigger

event," and also, they are documenting the financial or personal costs associated with an individual's activities, and tracking the number of visits to service points, along with additional trips to external entities. Journey maps also explore the emotions that clients may experience throughout their journey, considering their interactions with the processes and contextual feelings and pressures arising from their situations. The journey map can additionally evaluate the alignment between performance metrics, quality standards, and individual expectations. (US Digital Services,2014; IDEO,2015; Solomon,2017; Karippacheril,2018; Lindert et al.,2020). Collaborating with delivery chain process maps, journey maps can reveal genuine bottlenecks, inefficiencies, non-value-added or redundant steps, delays (including their root causes), and discrepancies between expectations and reality (Lindert et al.,2020). They may unveil unnecessary bureaucratic procedures that prove inefficient for individuals and the overall delivery chain, such as process duplications and document requests. Journey maps serve as crucial inputs for "business process redesign" and naturally contribute to enhancements in individual services. Figure 6 illustrates the journey map of an unemployed individual for unemployment assistance benefits and services.

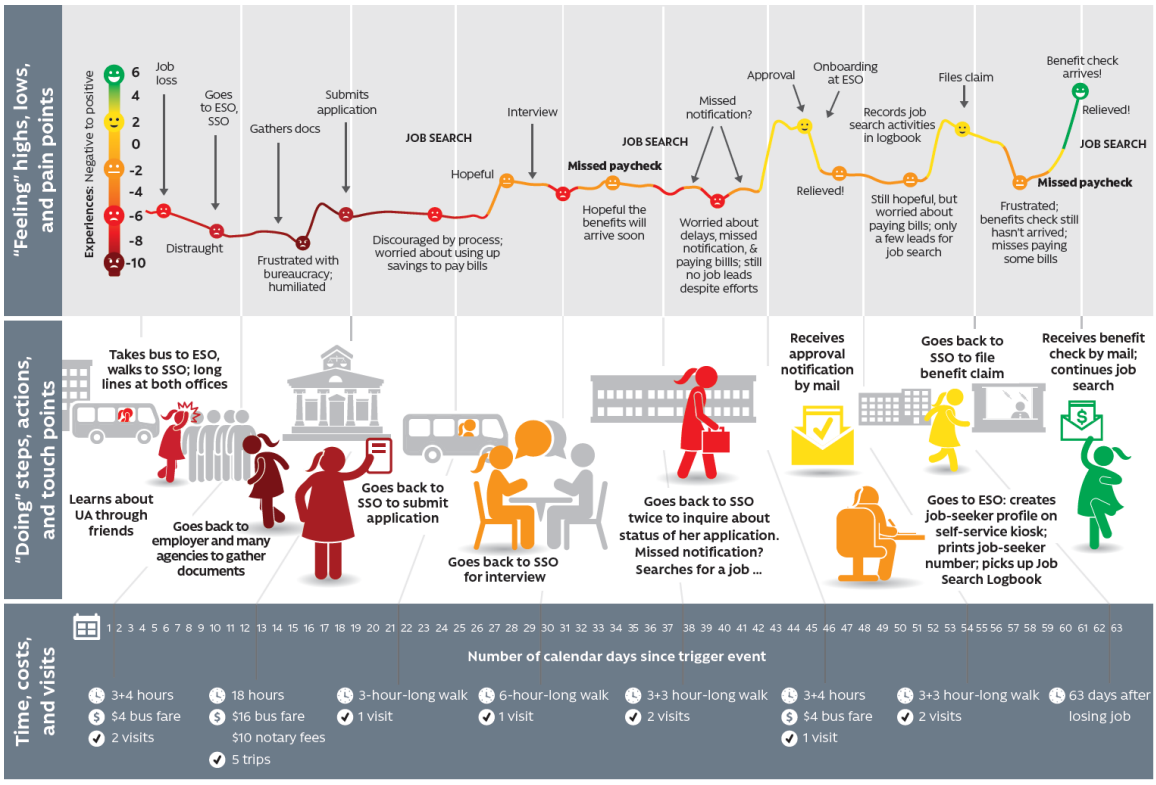


Figure 6. Journey map for unemployment assistance benefits and services (Source: Lindert et al.,2020). ESO = Employment Service Office, SSO = Social Service Office, UA = Unemployment Assistance)

The journey map includes communication and interaction. Communication is a dominant feature of the social protection delivery chain. Strategic and operational communication is crucial to the effectiveness of social protection policies and delivery systems. Strategic communication builds awareness, understanding, and support among stakeholders, whereas operational communication facilitates transparency and trust in delivery processes. Weak communication can lead to negative perceptions, a lack of credibility, and program failure. A communication assessment identifies key stakeholders and develops a communication plan specifying each stakeholder's objectives, messages, tools, and risks. Communication is integral to outreach, intake, registration, enrollment, payments, service provision, and grievance redress. Different technologies and tools have been utilized, such as direct interactions, phone, email, SMS, and mass media. Despite their importance, social protection programs often lack dedicated resources for communication planning and implementation, relying on non-specialized staff or one-time activities by external entities (Lindert et al.,2020). Successful communication strategies involve regular diagnostics, plans, updates, and monitoring with dedicated resources and well-staffed teams.

Section 2.0. Social Protection Information Systems – Operating Model Variations

Social protection information systems are software applications that manage information for social protection purposes and functions (Leite et al.2017). These systems link households and individuals to programs and services when needed by collecting, organizing, storing, processing, and distributing required information (Williams & Moreira,2020). Data analytics and the reporting part of social protection information systems are also critical, as more data and advanced processing techniques are currently available. It is critical to mention that integrated delivery systems that support multiple programs rather than separate disconnected information systems for each program should be considered more efficient. Integrated systems include social registries and beneficiary operations management systems (BOMS), which automate eligibility decisions, benefit provision, and compliance monitoring. There is also a need for a business process orientation and a systems architecture approach when building integrated social information systems, including comprehensive process maps and a clear understanding of roles and accountabilities. Current technology is important in using smart options to develop efficient business processes. The goal is to build trust with people by ensuring the timely, accurate, and high-quality delivery of services and benefits through integrated social information systems. The fragmentation of social protection programs could raise obstacles to their implementation, and their design should be oriented toward reducing inefficiencies, coordination improvement, and harmonization through integrated delivery functions across multiple programs (Lindert et al.,2020). As briefly described in Section 1.1., four common variations have been identified in social protection operating models worldwide. The first pair contrasts the separate delivery systems for each program with integrated systems for multiple programs, thus addressing the coordination challenge. Effective coordination should be applied at both policy and operational levels. The multidimensional nature of social protection programs is a reason for the coordination and bundling service approach. There are several drawbacks to operating separate delivery systems for each program, affecting individuals and the administrative burden. Recognizing these issues, some countries are transitioning into integrated or coordinated systems to deliver multiple programs. Various approaches to integration can be implemented, including coordination along the delivery chain, shared client interfaces, inter-institutional coordination, and the integration of

information systems. Additionally, social protection delivery systems have a growing and expanding role in linking people to interventions beyond social protection, such as health insurance, energy subsidies, housing benefits, etc., and coordination is a prerequisite. The second pair distinguishes between on-demand systems accessed by clients and administrator-driven approaches that conduct infrequent mass registrations and address inclusion issues based on administrative capacity and funding constraints (Lindert et al.,2020). The on-demand approach allows individuals to apply for benefits at any time, driven by their needs, whereas the administrator-driven approach registers clients massively during specific periods. The choice between these models depends on the program's objectives and context. On-demand systems are prevalent globally, offering flexibility but requiring a continuous administrative network. By contrast, in developing countries, administrator-driven systems are common, particularly for poverty-targeted programs, owing to capacity and funding limitations. The two models differ in philosophy, initiation of engagement, individual or group registration, and timing. The on-demand approach emphasizes dynamic inclusion, allowing people to apply or update information anytime. By contrast, administrator-driven systems are more static and infrequently conduct massive registrations. The implications of these models are visible along the entire delivery chain, from outreach, intake, and registration to benefits and services, beneficiary operations management, and responses to shock. The on-demand approach fosters dynamic inclusion and portability of benefits but may face challenges in managing demand. In contrast, administrator-driven systems control entry doors through infrequent registrations and quotas but may lack transparency. Both models involve trade-offs between inclusion and financing limitations with variations in the spectrum. Some countries are transitioning from administrator-driven systems to on-demand systems as capacities improve. The choice between models depends on local administrative capacity and budget availability (Lindert et al.,2020). Over time, the evolution of social protection delivery systems has emphasized the importance of simplicity, quality implementation, and client-friendly interfaces. These systems are interconnected with broader government structures, and there is a need for efficient information systems, privacy standards, and interoperability[1]. Moreover, social protection systems can potentially contribute to broader governmental functions and financial inclusion. In addition, while there is no single blueprint for social protection delivery systems,

[1] A very defined concept referring to the design of systems working together. To achieve that, harmonized data standards, governance models and business processes are adopted.

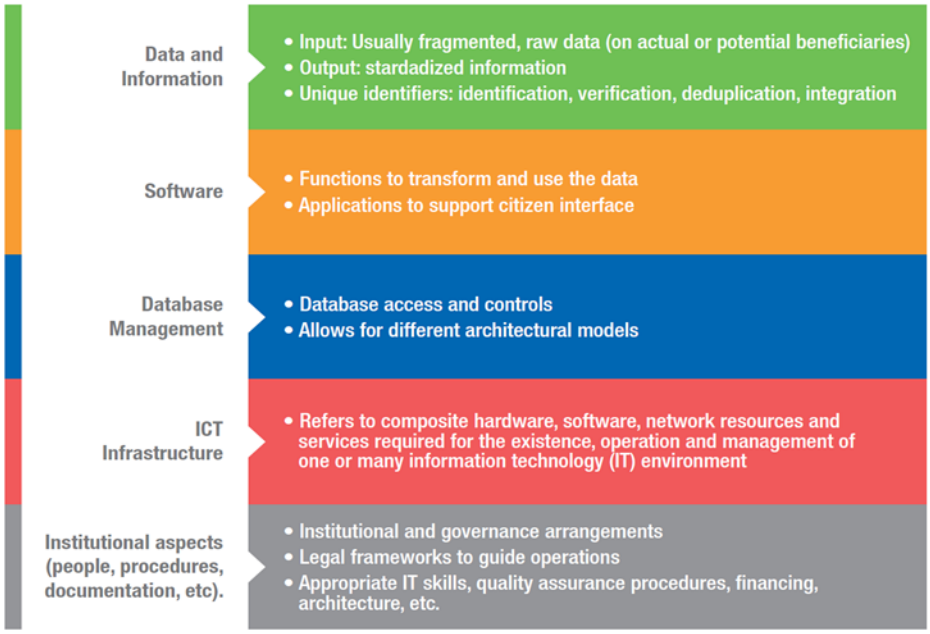
commonalities exist, and the provided framework could guide and organize a wider understanding of social protection information system implementation. Principles that address inclusion and coordination challenges, advocating for effective and efficient systems that reach the intended population, including the most vulnerable, and operate in high coordination contexts should be followed.

Section 2.1. Data Feeding in Social Protection Information Systems

The primary data sources for social protection information systems can be found in social registries, integrated social registries, beneficiary registries, integrated beneficiary registries, civil registries, national ID platforms, national household surveys and censuses, tax data, land cadastre data, geographic information systems (GIS) data, bank data, health and education ministry data, ministry of finance data, and government human resources databases (Barca,2017; Leite et al., 2017). Integrated forms are supersets of simple forms. Of course, these sources could be expanded, especially where there is no confidence that the collected data are accurate enough, there is limited data for decision-making, or even when the cost of data collection and storage is prohibitive. Mobile phone data (Blumenstock et al.,2015), remote sensing data, geographical information systems data, and sensor data can play an essential role in this case. In this context, more sophisticated collection, storage, and analysis methods should be implemented along with traditional collection and storage methods. Databases for unstructured data, cloud services for storage, and machine learning techniques for analysis and prediction can be used under this framework, opening a new range of social protection information systems applications. As Barca (2017) states, many low- and middle-income countries have already fully institutionalized social protection information systems, and many more are developing such systems. Additionally, different types of platforms can be designed and used, such as social protection G2P (government to person) payment, multi-program (and multi-provider) platforms for payment administration, and grievance redress mechanisms (GRMs) for appeals and complaint handling (Lindert et al.,2020). Integrating these platforms is crucial for ensuring the accuracy, efficiency, and effectiveness of the delivery of social programs, minimizing administrative costs, and fostering interoperability across different databases. A whole-of-government architecture that relies on data integration and interoperability frameworks is essential for enabling data exchange between various administrative information systems. Examples include linking social registries with

databases such as civil registries, land cadasters, tax systems, and more to create comprehensive assessment profiles for individuals and households. Interoperability involves political, legal, organizational, semantic, and technical aspects and requires political endorsement, legal compliance, shared objectives, semantic understanding, and adherence to IT architecture standards (Lindert et al.,2020). Leite et al. (2017) demonstrated an integrated social protection information system in Chile that combined a social registry, beneficiary registry, inventory of social programs, and geo-reference information systems.

Chart 2. Elements of Social Protection Information Systems



(Source: Leite et al.,2017)

In Estonia, a data exchange layer called X-Road (MEACE,2011) has been developed (Figure 7) based on interoperability principles to allow people, government entities, institutions, and companies to exchange securely and access information maintained in several databases over the internet, based on the EU 'Once-Only Principle,' which states that "The State shall not request from citizens and businesses any data that are already in its possession" (European Commission, 2016).

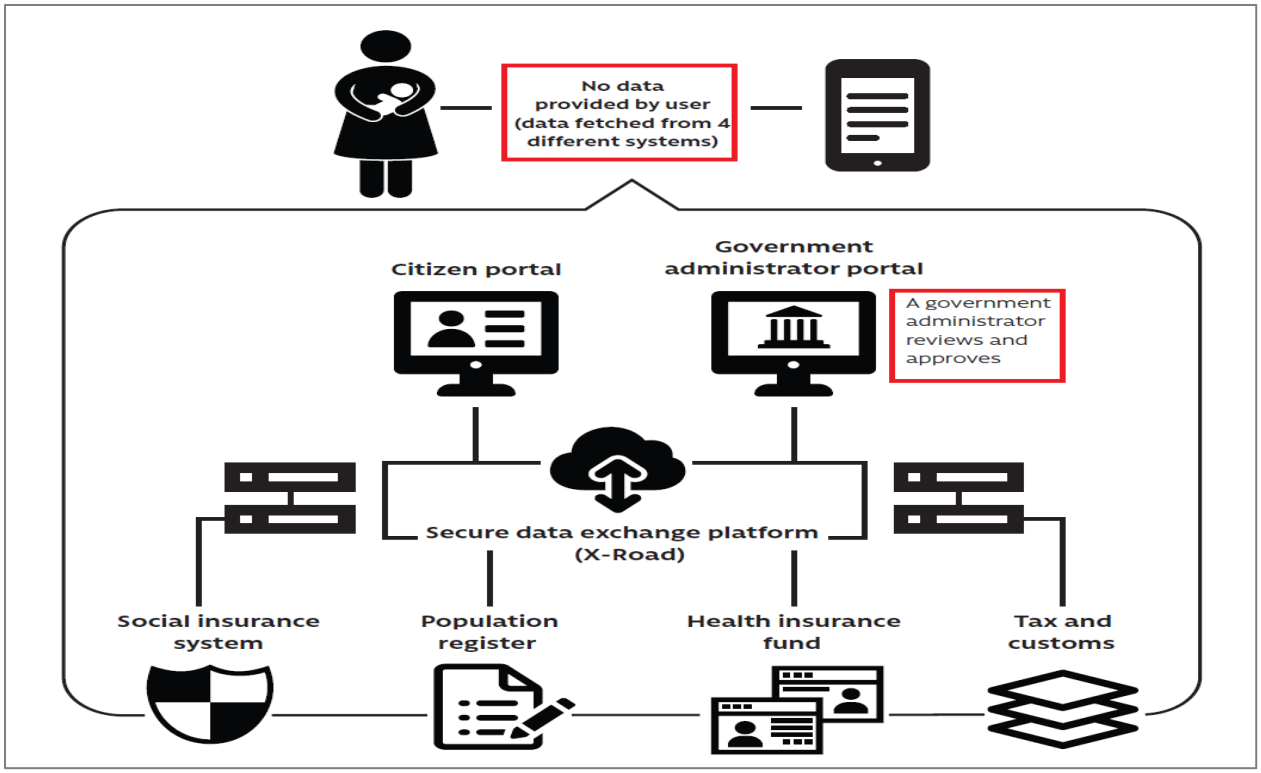


Figure 7. X-Road, data exchange platform, Estonia (Source: Ministry of Economic Affairs and Communication, Estonia, 2011; Lindert et al.,2020)

Data privacy and protection are crucial, given the sensitivity of information in social protection programs. Governance and security measures in IT systems are needed to ensure the confidentiality and accuracy of personal data. Despite the necessity of information sharing in integrated social information systems, safeguards must be in place to prevent unauthorized access. Governments are increasingly adopting shared data center approaches and cloud-based solutions to reduce costs, minimize investment duplication, and take advantage of computing power. However, potential concerns have been raised regarding the loss of control and additional security issues associated with cloud-based infrastructures. Moreover, social protection registries may not be effective in emergency situations where immediate intervention is required after a shock. An unforeseen event can affect many interconnected entities (individuals, states/countries, organizations, systems), and the response should be adaptive and effective, guaranteeing the continuity of smooth recovery.

Section 3.0. Adaptive Social Protection – Not just Social Protection

The Adaptive Social Protection (ASP) framework aims to build household resilience for each shock. Resilience is "The ability for a household/individual to prepare for, cope with, and adapt to shocks in a manner that protects their well-being: ensuring that they do not fall into poverty or become trapped in poverty as a result of the impacts." Bowen et al. (2020) describe a resilient household as one that can first prepare for a shock to minimize and mitigate its impact on well-being and prevent poverty, then cope with a shock's immediate effects to minimize their impact on well-being, and finally adapt in a manner that reduces exposure and vulnerability over the long term. Programs based on Adaptive Social Protection can have both ex-ante and ex-post approaches and processes. Before the shock occurs, direct access to social protection registries and active communication channels between entities related to risk management plans can prepare countries for such events. After the shock, an adaptive strategy called vertical expansion could provide direct benefits to existing beneficiaries using data from existing social protection registries without further analysis or updating. Another approach, called horizontal expansion, is to expand support to non-existing beneficiaries, preventing them from practices that can reduce their resilience (Figure 8), such as selling their livelihood assets or reducing their children's food consumption (Bowen et al.,2020). Moreover, the Sendai Framework for Disaster Risk Reduction (2015 – 2030), an international document that was adopted by the United Nations (UN) member states, defines as priority 4, "Enhancing disaster preparedness for effective response, and 'Building back better' in recovery, rehabilitation, and reconstruction" (Hallegate et al.,2018; Bowen et al.,2020).

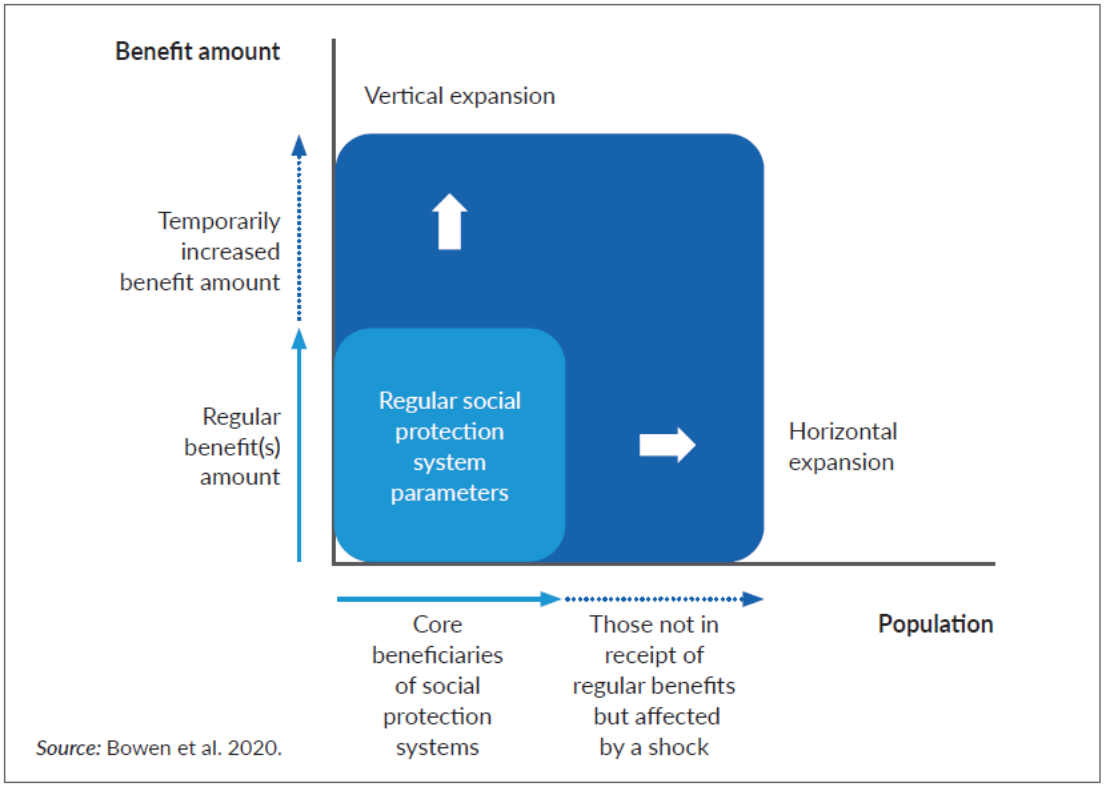


Figure 8. Visualization of shock responsiveness through vertical and horizontal expansions (Source: Adaptive Social Protection – The delivery chain and shock response, Gabrielle Smith, and Thomas Bowen, GFDRR, WB, 2021)

It is critical that the poor and vulnerable (individuals/households) should be in a better and more resilient state, with lower exposure and vulnerability than before the shock (Manyena et al.,2011; Frankenberger et al.,2012). Bowen et al. (2020), based on global experience, support that Adaptive Social Protection systems require, apart from long-term thinking, investments in four building blocks (Figure 9): flexible delivery systems (programs), interoperable information systems (data and information systems), predictable financing for contingent liabilities (finance) and ex-ante coordination mechanisms and capacity investments (institutional arrangements and partnership), to be effective and efficiently scalable. Regarding terminology, it should also be mentioned that some authors distinguish regular social protection programs from adaptive social protection programs using the term "routine" (routine social protection programs) to differentiate the first from the adaptive ones, which are designed to achieve additional objectives (Barca et al.,2017).

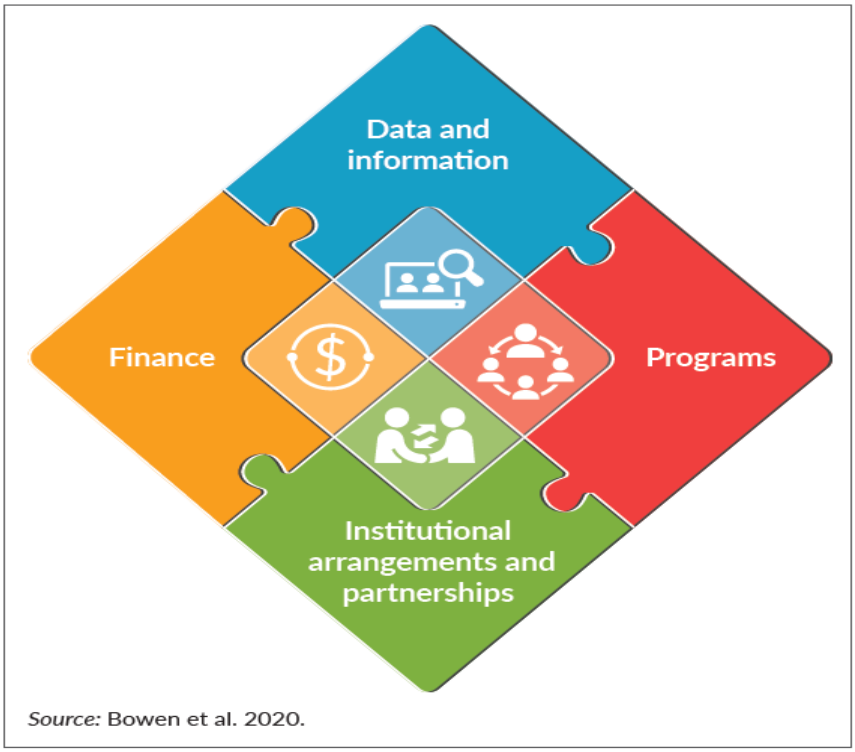


Figure 9. The Adaptive Social Protection building blocks (Source: Adaptive Social Protection – The delivery chain and shock response, Gabrielle Smith, and Thomas Bowen, GFDRR, WB,2021)

Adaptive social protection programs' objectives differ from routine social protection programs, which means that the core queries for setting up such programs are also different. Although the data and information required may be similar, an expansion is necessary. The key questions that need to be addressed are: Who is already covered by routine social programs, and who is not? Who needs support from the non-existing beneficiaries? Who should be targeted for support after a shock? How can this information be gathered quickly and inexpensively? (Barca,2017). Another important consideration is the geographical location of the affected individuals or households). This includes information such as the percentage of affected individuals or households in a particular region. It is also important to determine when a shock response is needed and what triggers this response (for example, Early Warning Systems – EWS, can ensure timeliness of response). After analyzing the situation, the appropriate intervention type and coverage must be determined. However, the final decision for implementation will depend on available infrastructure, resources, and capacity.

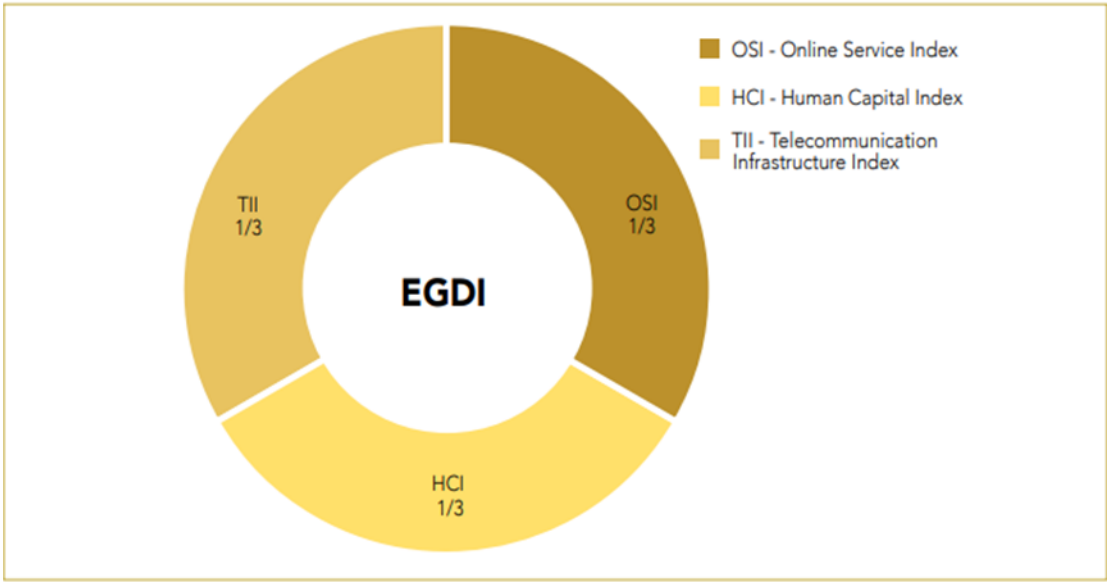
Section 3.1. Principles and Features for Social Protection and Adaptive Social Protection Information Systems Design

The basic principles that apply to any social protection information system and ensure its performance, as stated by Williams & Moreira (2020), are the quality of the data and the mechanisms for interoperability and interfacing with complementary information systems. Data quality includes relevance, accuracy, currency, completeness, and system coverage (Williams & Moreira,2020). In this context, the data in the system should be relevant to decisions and captured accurately. Data completeness can be achieved through verification and validation protocols, and the currency of the data can be achieved through frequent data updates (Williams & Moreira,2020). Developing distinct modules aligned to different social protection information system processes can also ensure ease of accessibility and use (Williams & Moreira,2020). However, mechanisms for interoperability facilitate advances in updating, validating, and verifying data. Duplicate data stored in different social protection information systems can be reduced if the system is designed on an interoperability basis and cross-checks across systems (such as national identification, social security, and government tax systems) can be easily implemented in interoperable environments. Coordination and data-sharing with other information systems can also be achieved. The management, monitoring, and delivery of social protection information systems are improving through interoperability mechanisms, even if the system is intended to support only a single program (Williams & Moreira,2020).

Section 3.2. E-Government Development Index – An Indicator and an Enabler

United Nations member states have established the E-Government Development Index (EGDI) to demonstrate participation in the information society for each country member. The EGDI can be an important indicator of the quality of service and performance when an adaptive social protection program needs to be developed. Apart from the website development patterns in a country, the EGDI incorporates access characteristics, such as infrastructure and educational levels, to reflect how a country uses information technologies to promote access and inclusion of its citizens. EGDI is a composite measure of three critical dimensions of e-government: provision of online services, telecommunication connectivity, and human capacity.

Chart 3. The three components of the E-Government Development Index (EGDI)



(Source: adapted from https://publicadministration.un.org/)

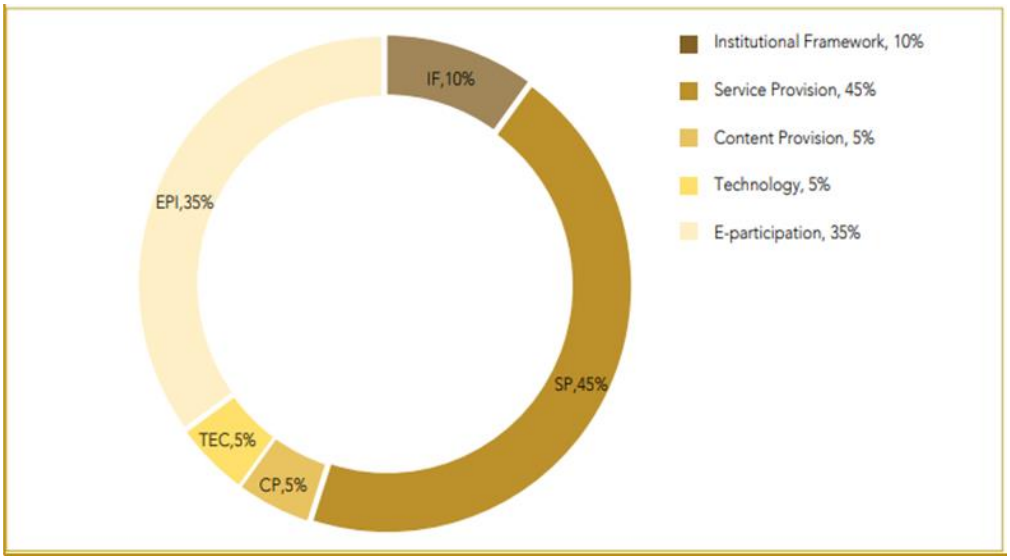
The design of EGDI aims to give a performance rating to national governments relative to one another rather than to measure an absolute value. The EGDI is a weighted average of three normalized scores on three dimensions of e-government: scope and quality of online services (Online Service Index, OSI), development status of telecommunication infrastructure (Telecommunication Infrastructure Index, TII), and human capital (Human Capital Index, HCI). The formula for the EGDI is as follows:

$$EGDI = 1/3\ (OSI\ normalized + TII\ normalized + HCI\ normalized)$$

Each index is a composite measure that can be analyzed independently. It is worth noting that before the normalization of the three indicators, a Z-score standardization procedure is implemented for each to ensure that the three component indexes equally determine the overall EGDI. After EGDI implementation, countries are classified into four levels based on their EGDI values: very high (0.75 to 1), high (0.50 to 0.7499), middle (0.25 to 0.4999), and low (0.0 to 0.2499). Each group is then divided into quartiles, and the final class rating, in descending order, is as follows: VH, V3, V2, and V1 for the very high group; HV, H3, H2, and H1 for the high group; MH, M3, M2, and M1 for the middle group; and LM, L3, L2, and L1 for the low group. In 2022, an update refined the formula for the Online Service Index (OSI) to align it with the Local Online

Service Index (LOSI) by categorizing the assessment questions into five discrete areas and forming five sub-indices: institutional framework (IFI), service provision (SPI), content provision (CPI), technology (TECI), and e-participation (EPI). The OSI is calculated based on the normalized values of each subindex after the weight assignment, based on the relative proportion of questions belonging to the associated category in the OSI assessment questionnaire.

Chart 4. The five subindices of the Online Services Index



(Source: adapted from https://publicadministration.un.org/)

Social protection information systems (SPISs) store sensitive information about individuals and households, including their health, education, and income status; therefore, it is crucial to ensure the security of these data. Access to different use cases should have graduated levels of access, and preventing breaches must be a detailed design component for SPISs. This means protecting both the hardware infrastructure and data storage is critical, particularly during emergencies and shocks when the systems are more vulnerable. Policies for data access that stakeholders have agreed upon can ensure clarity, and frequent audits on SPISs can increase security levels. Additionally, each country's legislation and policies adopted by SPISs must align with international standards and norms (Williams & Moreira,2020).

Section 3.3. Global Cybersecurity Index

The Global Cybersecurity Index (GCI) is a measure of the security level in information systems for different countries. It was established by the International Telecommunication Union (ITU) and as stated on the ITU's webpage, is considered a reliable reference for measuring countries' commitment to cybersecurity worldwide. The GCI is based on five key pillars: legal measures, technical measures, organizational measures, capacity development, and cooperation. Each pillar assesses a country's level of development and engagement in cybersecurity through a series of questions and indicators. The legal measures pillar measures the laws and regulations on cybercrime and cybersecurity, while the technical measures pillar evaluates the implementation of technical capabilities through national and sector-specific agencies. The organizational measures pillar looks at national strategies and organizations implementing cybersecurity, while the capacity development pillar focuses on awareness campaigns, training, education, and incentives for cybersecurity capacity development. Finally, the cooperation pillar assesses partnerships between agencies, firms, and countries. The index maps 82 questions with 20 indicators across five pillars. In 2020, 194 countries were measured, 169 focal points were indicated, 150 questionnaires were submitted, and the median overall score growth since the last GCI (ITU, 2018) was 9.5% (ITU, 2020).

Section 3.4. Dimensions of Data Quality in Adaptive Social Protection Programs

Although routine social protection programs have remarkable similarities in their basic design principles with adaptive social protection programs, modifications must be made to the basic design principles to ensure their effectiveness in emergencies. This initially concerns the quality of the data and the information systems built on them. Barca (2017) expands a framework developed by Wang & Strong (1996) on six complementary dimensions of "data quality" that have a substantial impact on adaptive social protection cases. These dimensions include completeness (coverage), relevance (appropriateness), currency, accessibility and accuracy, and security and privacy. It is important to note that these dimensions are interdependent and often involve tradeoffs between them. This study provides a detailed explanation of these six dimensions. The first dimension is completeness, which refers to what is perceived as the complete set each time.

Sometimes, the whole set is the population in the affected areas, while other times is the population in need in the affected areas. Depending on the desired target of each program, completeness can take different forms. For social protection programs, an existing social protection registry serves as the starting point for any response and expansion. Such registries generally classify individuals as either beneficiaries or non-beneficiaries. However, it is possible that households and individuals are not registered in any existing social protection registry. Social protection registries typically have issues related to completeness (the lack thereof), with many only covering a small proportion of the population in any given area (ILO,2017; World Bank,2018; Barca & Beazley,2019), especially in low-income countries with significant program coverage gaps (World Bank,2018). Therefore, in case of a shock event, a response that relies solely on existing social protection registries (often via vertical expansion programs) will exclude shock-affected individuals and households, as in Nepal's 2015 earthquake (Merttens et al., 2017), where approximately 30 percent of the affected population in a particular district was excluded from any support (Barca & Beazley,2019). This raises the question of whether existing social protection registries are based on real-world data or simplified assumptions.

Section 3.5. Types and Data of Population Targeting

Section 3.5.1. Targeting based on Geographical Orientation

While it is commonly assumed that the poor population in the province is the most vulnerable to shocks, actual events demonstrate that geographic targeting can limit national coverage and pose risks for utilizing existing social protection registries for shock responses (Barca & Beazley,2019). It is widely known that poverty is more common and more severe in rural areas compared to urban areas; however, urban territories can also be affected by similar shocks as rural areas or even more, mainly because they cannot sustain food security through their own agriculture and livestock production (Grosh et al.,2011; Gentilini,2015; Barca & Beazley,2019). In some cases, there is no direct correlation between the magnitude of a shock in a region and the economic status of the population residing there. As a result, many affected individuals or households are not covered under the existing social protection programs because they are not registered (Barca & Beazley,2019). As the process of urbanization intensifies across the world (World Urbanization Prospects,2022; West,2017), countries are adapting their social protection programs to include

more urban areas (World Bank and International Monetary Fund,2012). Some adaptive social protection programs prioritize or exclusively target specific geographical areas due to repeated natural disasters, often due to limited financial resources. However, limited resources can hinder coverage and potential expansion, leading to the use of unconventional methods, such as a lottery system for aid provision, as occurred during the El Niño crisis in Lesotho in 2016 (Kardan et al., 2017; Barca, 2019).

Section 3.5.2. Targeting based on Strategies and Policies

Strategies and eligibility criteria followed in routine social protection programs determine the quality and outcome of the programs, which are the basis for future extensions or direct actions. In a study by OPM (2017), various variables and components were identified that highlight the different functionalities of social protection and adaptive social protection programs. It is commonly recognized that the poor population is more vulnerable to various shocks such as rising inflation, natural disasters, and diseases (Grosh et al.,2011; Hallegate et al.,2016). Therefore, social protection programs that target the poor can provide adequate coverage to those in need, especially if they can reach more individuals and households. It is necessary to expand social protection programs in countries where coverage is low, and programs are targeted toward specific populations in need, according to several studies (Isik-Dikmelik,2012; O'Brien et al.,2018; Barca & Beazley,2019). By targeting poor populations, more detailed data can be collected on social and economic conditions, allowing for more informed decisions during times of crisis and when making necessary program extensions (Barca & Beazley,2019). The eligibility criteria for each program are crucial in determining its coverage and responsiveness to shocks. Therefore, the overlap is greater when the program's target and the type of shock coincide. For example, if social protection programs target the poor and vulnerable population, food security crises or shocks to the economy, since they affect this part of the population more, will be easier to deal with than natural disasters, which impact the population horizontally (O'Brien et al.,2018). Categorical targeting of physical entities (e.g., children and older adults) can be less effective in covering a humanitarian crisis; however, it outperforms other aspects (Slater & Bhuvanendra,2013). This type of targeting can be faster and simpler for rapid scale-up in emergency cases because fewer variables are needed for collection and evaluation (Barca & Beazley,2019). Moreover, apart from the fact that these population categories are the most affected by shocks, this targeting, as described by Barca & Beazley (2019), can have broader coverage and is less socially divisive. Targeting

policies also have some basic prerequisite requirements for inclusion (and the corresponding exclusion) in social protection programs, especially in shock response cases. On some occasions, citizenship requirements or protracted residence in the area affected by the shock directly exclude internally displaced individuals and refugees (Barca & Beazley, 2019). Additionally, some programs require formal national identification (ISPA,2017; Barca,2017; Barca & Beazley,2019). Given the fact that, in shock situations, it is very likely that these certification documents were lost or were damaged, if there was no other method of certification, the exclusion of parts of the population, including internally displaced and refugees, has a high possibility to occur (Barca & Beazley, 2019). Under certain circumstances, shocks also affect non-beneficiaries. Non-beneficiaries are those not included in any social protection program at the time of the shock occurrence. However, the coverage of non-beneficiary data varies among countries, ranging from zero to 90 percent (Barca,2017; Leite et al.,2017; Barca & Beazley,2019). The wide variation in this coverage depends on factors such as the policy regarding the part of the population that should be covered, the locations of data collection, and data collection techniques (Barca & Beazley, 2019). Census and survey techniques tend to ensure a higher coverage. The main characteristics of countries with high coverage of non-beneficiary data are the data-sharing arrangements with registries of other government entities and their objective to use and retain data for different programs over time (Barca & Beazley,2019). Therefore, where there is no high data coverage of non-beneficiaries, existing social protection registries can serve shock events and adaptive social protection programs via horizontal expansions (or piggybacking) (Barca & Beazley,2019). Moreover, when countries collect data in the aftermath of a shock, there is evidence of a high overlap between the newly collected data and the country's existing social protection registry. The three countries presented in Table 1 have overlapping ranges from 66 to 98 percent (Barca & Beazley,2019). The most likely reason for this is that those officially registered in social protection programs – theoretically, the most vulnerable – are also the most vulnerable in the real world. Nevertheless, a substantial proportion of the population is not covered and needs to be identified.

Table 1. Coverage of social registries and overlaps with affected households

	Coverage of the social registry (population percentage)	Coverage of flagship cash transfer program	Overlap between the new registry of affected households and the social registry
Ecuador	53 percent	10 percent (Bono de Desarrollo Humano)	66 percent (2016 earthquake)
Peru	60 percent	8 percent (Juntos)	80 percent (2017 floods)
Chile	74 percent	NA	98 percent (Various recent shocks)

(Source: Barca & Beazley, 2019)

Although, in some cases, there seems to be an almost perfect match between existing and aftermath emerging registries coverage, it is not always guaranteed, and it depends on many factors (e.g., the type of shock). This condition cannot facilitate horizontal expansion in emergencies, and many affected populations will be left out. It is more prudent in cases of adaptive social protection to consider factors more relevant to the event (such as official population numbers in the affected area, address details of the households in the affected area, etc.) to achieve the most significant possible coverage of the affected population. Modifying targeting criteria and processes is essential in cases where it is evident that existing social protection registries do not cover affected individuals and households, for example, in cases of cross-border displacement where no records for refugees exist (Barca & Beazley,2019).

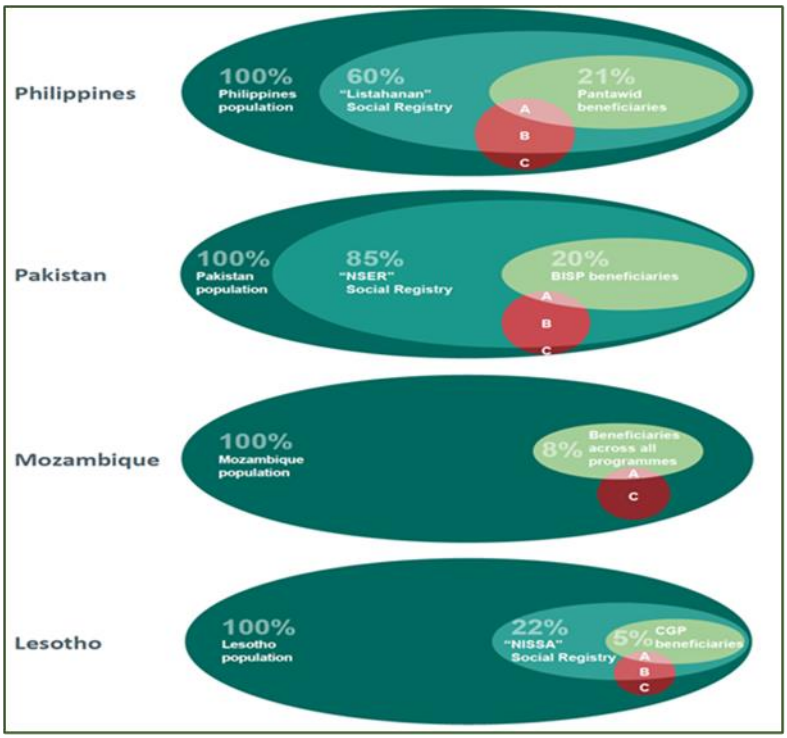


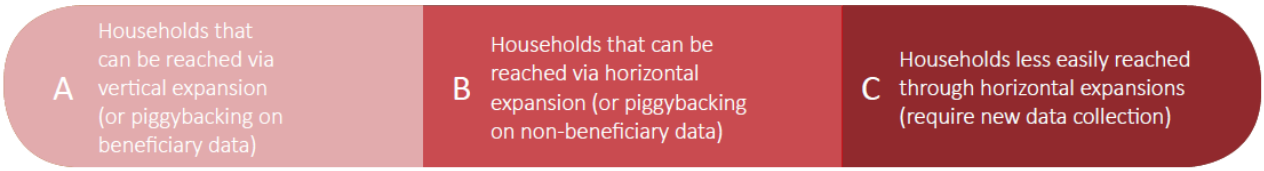
Figure 10. Comparison of four countries on social protection registries (adapted from Barca & Beazley, 2019)

Data collected for social protection registries are not always relevant or useful for shock responses. The design principles are different between the two conditions because the social protection registries are developed for long-term and repetitive use. In contrast, a shock response requires specific data and processes promptly. Nevertheless, the basic features that social protection registries adopt can be valuable sources of data on shocks and enhance the information systems developed for shock response. Concise socioeconomic data on individuals and households – in some cases, data held at the household level–in social protection registries, providing data on income, education, and health status, as well as for other parameters of living standards, can help identify the poorest part of the population, which is the most vulnerable to shocks. It should be mentioned that using tools that guarantee anonymity for data collection (e.g., household surveys) can raise obstacles when social protection data must be used in shock responses, as detailed information is excluded (Soares,2009; Word Bank,2018; Barca & Beazley, 2019). In addition, social protection registries can provide data (on individuals and households) that have geo-reference details, which can be aggregated by region or administrative areas. These data can be informative and useful in shocks and can help facilitate quick responses. In some countries, social

protection registries have interoperability features that facilitate data-sharing processes critical to shock response. Moreover, social protection registries have legal and institutional directives for data handling, updating, and operationality that can also benefit timely fashion and shock responses. Nevertheless, an open question is whether existing social protection registries comprise critical data that can help identify potential vulnerability regarding a shock before this happens and if there can be specific data analytic processes for existing social protection data to predict the population (individuals and households) that have a high probability of becoming vulnerable in shock cases. As Bastagli (2014) pointed out, the concept of shock-responsive targeting necessitates data that can capture unexpected fluctuations and vulnerability before a shock. The relevance of the already gathered data in social protection registries is diversified, as different programs[2] have different objectives, and none of these have been designed for disaster response. As previously described, we can significantly enhance the responsiveness to such events by leveraging Geographical Information System (GIS) data, which are inherently linked to the occurrence of shocks in geographic regions. Moreover, combined with available data, targeting based on geographical information can be a rapid approach to relief after a shock (Marzo & Mori, 2012; Hallegate et al.,2016; Barca & Beazley,2019). However, in countries where this data is unreliable (e.g., Fiji), vertical expansions for all beneficiaries nationwide can be implemented rather than only for the affected population (WFP,2017). An additional aspect of the data in social protection registries is that because it's frequently collected to determine eligibility criteria to deal with chronic poverty, it is not suitable for recognizing populations vulnerable to shocks (Alderman & Haque,2005; Grosh et al.,2008; Bastagli,2014; Kuriakose et al.,2012; McCord,2013; O'Brien et al.,2018). To address this issue, several countries have begun incorporating different variables, data, and algorithms into their social protection registries in a disaster awareness mindset, adopting smart targeting techniques (Kuriakose et al.,2012; World Bank,2013; Bastagli,2014). This integration considered the consequences of climate shocks. A good example is the Index of Vulnerability to Climate Shocks (IVACC) in the Dominican Republic, which estimates the probability that a given household may be impacted by climate shock. The IVACC index comprises three dimensions: a) estimated household income, b) housing characteristics (walls and ceilings), and c) proximity to hazardous natural elements (rivers, streams, or ravines)

[2] In British English the word "Programme" is used instead of the word "program". Since the meaning is the same, throughout the text the word "program" is used.

(Beazley,2017b; Barca,2017). In Pakistan, new Proxy Means Targeting (PMT) includes data on agro-climatic zones to determine susceptibility to climatic shocks as well as an effort to include geographic coordinates for all registered households (Barca & Beazley,2019). This can more efficiently target populations vulnerable to climatic shock (e.g., droughts, floods, earthquakes, etc.) (Watson et al.,2017). A similar case from the African continent (in Malawi) uses a modified questionnaire of the Unified Beneficiary Registry (UBR), which is a social protection registry, as well as an integrated beneficiary registry, to discover the vulnerability of households to climate shocks and occasional lack of food. Nevertheless, this questionnaire is inadequate for shock cases because of its infrequently updated approach (Holmes & Costella,2017; Barca & Beazley,2019). Furthermore, a study that compared different approaches for PMT targeting in Niger (chronic poverty and household economy status) highlighted the fact that both mostly use the same type of data – household data (Schnitzer,2016) while their performance is related to their targets (identification of the chronic poor and identification of seasonal household shocks (e.g., seasonal food insecurity). Thus, design differentiation in targeting social protection programs that rely on the same data can result in different outcomes (Barca & Beazley,2019). Although the variables that already exist in social protection registries can be used in different ways and can fulfill diverse outcomes, they often cannot support representing reality when a shock occurs. The ability of individuals and households to meet basic needs in the event of a shock is not easily determined. For example, food security cannot be confirmed in a shock, even if it is verified a short period earlier via a questionnaire. The timeliness of the data is a parameter with great sensitivity to shock responses. Therefore, timestamps of the data collection and the accepted periods for using the collected data should be defined. Holmes & Costella (2017) expressed another view that the answers to a questionnaire can capture only food production and consumption, not the quality or diversity of the food consumed. This fact was also mentioned when social protection registries were compared to emergency vulnerability evaluations (Kardan et al.,2017). Thus, qualitative parameters may not be identified using specific questions in a questionnaire, which indicates the importance of questionnaire design in capturing quality parameters. An important indicator of the relevance of existing social protection registry data for post-shock use is the type of shock itself. Post-shock resultants can be correlated more with existing data if the shock is recurrent or has slow progress compared with sudden shocks that cause population displacements (Barca,2017).



A, B and C. Potential for piggybacking on existing capacity and systems for data collection, management and validation.

Figure 11. Households potentially affected by a shock (Source: Barca & Beazley, 2019)

Differences regarding the variables (and the data) in social protection registries also depend on whether the population is considered beneficiary. Variables (and data) (Stair & Reynolds,2017) on beneficiaries are more extensive, pertinent, and useful than non-beneficiaries variables (and data). However, a common drawback of these methods is the limited number of targeted populations, and ensuring up-to-date validation remains an issue (Barca & Beazley,2019). In contrast, variables (and data) on non-beneficiaries, when they exist in social protection registries, rarely include ready-to-use information (e.g., GPS data, detailed profiles, etc.), as non-beneficiaries are left for the last stage during enrollment since they are not the first in line for support. Therefore, it is not unusual to abandon horizontal expansions because of difficulties verifying information on non-beneficiaries (Kardan et al.,2017). Nevertheless, in the aftermath of a shock, handling data on non-beneficiaries that are not governed by interoperability principles (e.g., data linked to external government organization databases or without confirmed updating, etc.) is a challenging issue (WFP,2017). Another significant aspect of data in social protection is their level of update. In the aftermath of a shock, data originating from a social protection registry cannot reflect reality, and revalidation is needed, especially on variables that can be changed during (and after) the shock event. As Barca (2017) refers, a registry, to be efficient for both routine social protection and shock response, should focus on the dynamic inclusion of new members (e.g., newborns, migrants), dynamic exclusion of outgoing members (e.g., deaths and relocations), and dynamic management of transient shocks (e.g., high unemployment rate, agricultural production failures, temporary outbreak of diseases). In addition, a registry should also be effective in handling transient shocks that last longer than expected, as the global pandemic demonstrated recently. Therefore, the design of social protection registries should avoid patterns that could lead to inclusion or exclusion errors. An example of this kind of design applied in Costa Rica, where a study determined which variables have a high dynamic profile and which do not (variables classification in high dynamics, e.g., income, occupation, and low dynamic, e.g., ownership, housing), leading to different updating

periods, and high dynamic variables are updated more frequently than low dynamic variables (Irarrázaval, 2004). In general, it is challenging to maintain up-to-date data in social protection registries, and it depends on numerous reasons. Starting from the separation between beneficiaries and non-beneficiaries, which means different designs and handling of the considered variables, to the updating policies that are distinct for the two groups. As seen in Pakistan, where two different registries, Benazir Income Support Program (BISP) and National Socioeconomic Register (NSER)), are compared, the BISP, which is oriented to beneficiaries, is regarded as more reliable (Watson et al.,2017). Moreover, as Barca & Beazley (2019) state, although these updates can be uploaded in routine social protection registries and enhance their overall performance, many countries do not adopt this approach to avoid jeopardizing the original data. This offensive attitude indicates, one more time, the need for interoperability in information systems for social protection. The abrupt rise in social protection needs in the aftermath of a shock cannot be supported by standard social protection registries because there are few chances for registration and updating in many countries (Bastagli,2014). National censuses and surveys are carried out at considerable intervals, and in numerous countries, this has been referred to as an issue that needs to be resolved (Watson et al.,2017; Holmes & Costella,2017; King & Tranchini,2017). A solution to this could be a more frequent registration design in social protection registries based on each country's profile and needs. Often, the targeting approach -targeting a specific part of the population – is the guide for the frequency of required updates. These updates include new values for existing variables and new variables for use and information extraction. For example, if the targeted part of the population is the poorest, more detailed variables than income (e.g., children with disabilities, personal assets, etc.) can distinguish, at a finer level, those in more need. Moreover, the shock type, which occurs more often in an area or even one unexpected shock, can set out the required variables and data update since different shocks affect the population differently. Ideally, the updating policy should be on demand and without constraints, especially in the case of shocks, where more information is always better. However, infrastructure and information system limitations can only sometimes fulfill this requirement. The infrastructure of information systems comprising social protection is susceptible to natural disasters and shocks. Frequently, shocks can destroy critical infrastructure for a timely response. Issues of accessibility are leading to sluggish responses, which sometimes means the loss of human lives. However, accessibility challenges may arise in various instances within a social protection framework. Generally, the term accessibility refers to the ease of

connecting different components or actors within a social protection environment. From this perspective, data-sharing policies play a significant role in making social protection information systems accessible. Authorization procedures, internal government agreements, and acts between government organizations and external entities can affect accessibility. According to Barca & Beazley (2019), data sharing can be promoted when organizations build relations over time, rather than relying on political associations. Additionally, accessibility can be enhanced through the adoption of underlying technologies, both hardware and software, which have been integrated into social protection information systems. Infrastructure technologies can secure the reliability and capacity of the systems – users, access to resources, network connections, and electricity issues– while software technologies can provide interfaces for instant communication between stakeholders without compromising the system's security.

Section 3.6. Data Accuracy

Another significant factor that can affect the entire process and outcomes of responding to social protection issues is the accuracy of the data. Data accuracy refers to error-free records without omissions that can be used as reliable sources of information. In data management, data accuracy is the first and most critical component of a data quality framework. In a book by Olson (2003), the form and content were declared two of the most essential characteristics of data accuracy. Inaccurate data may disrupt processes and hamper operational efficiency, particularly during shocks when a timely response is required. Barca (2017) identified two categories of perceived accuracy of the data: one related to the quality of data collection, verification, and validation, and the other related to the trustworthiness of the institution responsible for collecting and housing the data. Social protection registries are sometimes disused because of the absence of trustworthiness (Kardan et al.,2017). In Lesotho, where mechanisms for verification were not in place, and proxy recipients could represent other individuals, there was an extended absence in death reports, resulting in a higher total number of older adults in the registry than their total number in the country (Dietrich et al.,2016). Besides, data accuracy is an issue in several more countries (e.g., Mali, Malawi, etc.) (O'Brien et al.,2018; Holmes & Costella,2017; Kardan et al.,2017).

Section 3.7. Data Security and Privacy in Adaptive Social Protection

Data security and privacy are central elements of routine social protection programs (Barca,2017). Personal data from potential beneficiaries are used as the primary source to determine eligibility criteria, most of which are sensitive, such as yearly income, biometric data, health status data, and assets. Sharing, losing, or misusing these data types will likely lead individuals and households to more vulnerable conditions (Hosein & Nyst,2013), especially in the aftermath of a shock. Moreover, personal rights and freedoms can be threatened (Sepulveda,2017) if data processing is improperly performed[3]. The scale of the information systems used for social protection programs also plays a vital role in ensuring the privacy and security of individuals' data. Large integrated information systems are considered more exposed than small systems, primarily because of the multiple actors involved in the data pipeline. Data collected for social protection purposes include sensitive information on citizens, which can facilitate emergency processes. However, in cases of violence and conflict, such as the Rwandan genocide, this information may be used for other purposes (Seltzer & Anderson,2001). The above highlights the lack of standardized protocols for ensuring a secure pipeline for all information stages (collection, transfer, storage) in social protection programs. In cases of emergency, this oversight can lead to severe breaches. Due to the need for rapid decision-making, extended use of unsafe channels is applied; moreover, because of multiple actors' involvement, which is not cooperating based on interoperability principles. These phenomena are more frequent in countries where national laws do not abide by international protocols (Barca,2017). Additionally, natural (or man-made) disasters could lead to the loss of data, even digitally stored ones, mainly if there are no backup and security policies. As Barca (2017) states, "backup and security should conform to ISO 27001 – an approach to managing confidential or sensitive information – so that "it remains secure, confidential, and with its integrity intact." The framework of the General Data Protection Regulation (GDPR), approved by the European Union (EU) Parliament (April 2016) and enforced as of May 2018 for all EU countries, demonstrates the current data security and privacy management strategies. The GDPR mirrors a

[3] The right to data privacy is inherent in the Universal Declaration of Human Rights (UDHR), the International Covenant on Civil and Political Rights (ICCPR), and the ILO Social Protection Floors Recommendation 2012 (No. 202), which as Barca (2017) demonstrates, explicitly calls on states to "establish a legal framework to secure and protect private individual information in their social security data systems' (paragraph 23), Barca (2017).

broad spectrum of European citizens' rights regarding their personal data. A short list includes the right to privacy, information, objection, and erasure. However, many low-income and middle-income countries do not follow this approach in their social protection programs (Sepúlveda Carmona,2017; 2018). Using existing social protection data for shock preparedness and response is a common practice, and several authors in the field refer to fundamental principles that should be followed in this context. A set of predefined objectives – different from the usual use – for processing data should be established, along with authorization for the specific goals. Moreover, a set of the minimum required data should be stated, and any expansions of that set should have a standard approval process. Furthermore, using clearly defined design principles, personal data storage, transmission, and use should be protected from external entities. This can be achieved using a risk mitigation analysis in emergency cases. In addition to protection, transparency policies should be followed to make personal data (including biometric data) available for access and control in any event of concern or complaint (CALP,2013; OPM,2015a; Barca,2017; Sepulveda Carmona,2018;2019). There is an emerging tradeoff between efficiency and data privacy in such situations. In Turkey and the Philippines, privacy laws limit the flow of information between social protection data registries and external agencies (Barca & Beazley, 2019). In some instances, when the aim is to make conclusions about the population rather than the individuals to address issues regarding privacy, data manipulation methods could be implemented, such as k-anonymity, which produces personal anonymized data while data remain practically useful (Sweeney,2002), and ε-differential privacy (Dwork et al.,2006), however, these methods have several tradeoffs.

Section 4.0. Functional Cases of Social Protection Systems Around the Globe

The chronically poor should not be the only target group of the population that is likely vulnerable to natural disasters and shocks. Social protection information systems based on smart technologies can be used more specifically to identify vulnerable individuals and households, regardless of their economic status. Data on the area, data on the livelihoods, and household's level of climate exposure, the so-called 'climate-informed' or 'climate-smart' targeting, could identify the individuals and households in temporary need of the chronically poor (Kuriakose et al.,2012; Barca & Beazley,2019), and for this, social protection registries which include both beneficiaries and non-beneficiaries can provide better results since the inclusion is higher compared to other forms.

In the Dominican Republic, the Index of Vulnerability to Climate Shocks (IVACC) contains three dimensions: i. housing characteristics (e.g., walls and ceiling); ii. estimated income; and iii. proximity to a hazardous natural element (river, stream, or ravine), and determines the probability that a given household may be affected by climate shocks (Beazley,2017). Furthermore, in Pakistan, there is an effort to include data on climatic vulnerability and geographical coordinates for all registered households in a new proxy means testing (PMT). Including indicators of climatic zones could enable a more effective targeting of populations vulnerable to climatic shocks (e.g., droughts and floods) (Watson et al.,2017). In Malawi, an update on the questionnaire used for the development of the UBR was made to correlate annual predictable food gaps and climate shocks to household vulnerability (Barca & Beazley, 2019); however, this is not considered adequate in the case of shocks by Holmes & Costella (2017). Generally, the data collected for social protection registries differ from those needed to identify vulnerable households (Barca & Beazley,2019). A study by the World Bank compared different broadly used targeting approaches to evaluate their performance in Niger. Proxy Means Testing (PMT), developed for chronically poor identification, and the Household Economy Approach (HEA), a livelihood analysis tool, were compared. The results verified the superiority of PMT in identifying the chronically poor and of HEA in identifying the seasonal food instability of households. Nonetheless, research demonstrates that both approaches rely on the same type of data (Schnitzer,2016) and that adjustments to these data could lead to different targeting results. According to Barca & Beazley (2019), while poverty-targeted programs lean toward collecting socioeconomic data, different program structures on other criteria could also gather the required data for the same analysis. Using geo-referenced data in databases for social protection programs could provide a thorough depiction of populations susceptible to natural disasters. However, they should be unified with Digital Rights Management (DRM) technologies to ensure legal access to digital content. In the Dominican Republic, the social protection registry called “Sistema Unico de Beneficiarios” (SIUBEN) includes 85% of the population, and data are geo-referenced for all registered households, providing the opportunity for comprehensive hazard mapping, which can identify the population exposed to risks (Beazley,2017b). Furthermore, in Pakistan, the national social protection registry called “National Socio-Economic Register” – NSER, in its updated form, will reach 90% of the population and incorporate Global Positioning System – GPS data (Watson et al.,2017). The specific geographical characteristics of each region or country, the frequency of natural disasters, and the population

living there (e.g., population density, economic status, age variation, and the population's livelihoods) emphasize the need for additional required data for better adaptation. As Barca & Beazley (2019) state, in the case of seasonal floods, hurricanes, or typhoons, the geo-location of households (e.g., proximity to water elements) could be used as additional data for improved response results. Additionally, regarding seasonal droughts, data on food instability could help identify vulnerable individuals and households more effectively and promptly. Another significant aspect that could be the reason for additional data collection is the type of land use (or water bodies) near livelihoods, mainly if seasonal disasters occur. If dependence on agriculture in a region is high, the cost of vulnerability will be proportional. The same scheme applies to cases of economic shrinkage in regions/countries where reliance on remittances is high (Barca & Beazley,2019). However, while vulnerable households in rural regions can be identified using additional data, the population in urban areas cannot be easily reached by utilizing this approach. Different types of additional data are required in urban areas to achieve improved coverage during natural disasters and shocks (e.g., personalized mobile phone data). The data of social protection registries, combined with any additional data that can provide a more specific profile regarding individuals and households (e.g., geo-location), could also help estimate the number of individuals or households a disaster would impact. Estimations of the potentially affected population were conducted in the Philippines by the Department for Risk Reduction and Operations Office (local name: Listahanan), utilizing social protection registry data (Bowen, 2015). These assessments could aid in improved planning for shock response and facilitate the workflow of financial support in the aftermath of a disaster (Barca & Beazley,2019). However, in most relevant efforts, the data are from the poor and vulnerable (via social protection registries). An exclusion approach could also be applied if there is available data on individuals or households by the exclusion of the regions (and consequently the exclusion of individuals/households) that are less likely to be affected by the disaster (based on several concurrent criteria such as distance from the risk source and economic status of the population). This approach can save both time and effort if such conditions exist. However, it should be mentioned that ignoring part of the population in the estimation phase (e.g., exclusion of the not-poor) could lead to exclusion errors if the disaster is not seasonal or recurrent. Barca & Beazley (2019) referred to the correlation between the operationally relevant data collected and the response strategy. In regions/countries where recurrent shocks occur, the response actions can be standardized, at least for these shock events,

and the relevant data can be identified earlier in the pipeline. A verified example of using operational data in advance is the Hunger and Safety Net Program (HSNP) in northern Kenya, where arid lands are located. HSNP has the potential to allocate horizontal expansion and provide cash to poor households during natural disasters. Moreover, by implementing a sophisticated design, the HSNP has pre-enrolled all households in the region in four counties, associating each household with a bank account. If the eligibility criteria are met, each household receives ad-hoc compensation from HSNP in the case of a natural disaster – more frequently, a drought– based on their current wealth score, allowing for several horizontal expansions (O'Brien et al.,2018; Barca & Beazley,2019). It is a reality that vulnerable areas are often prioritized in social protection registries. The essential features that characterize an area as vulnerable are the consistently high poverty levels (chronic poverty) and high exposure to natural disasters and shocks. Targeting vulnerable areas is mainly based on geographic data, and the development of maps demonstrating poverty levels and exposure to shocks is advantageous, particularly in regions with recurrent/seasonal shocks. However, as urbanization on a global scale is increasing at a high rate, adaptive social protection should adjust to this fact, and research should be conducted on how conditions such as chronic poverty and areas exposed to shocks can be visualized in an urban context. The Making Cities Resilient 2030 (MCR 2030) initiative of the United Nations Office for Disaster Risk Reduction (UNDRR) promotes urban resilience and supports cities in reducing disaster risk. However, there are several stages under the MCR 2030 framework. Disaster risk reduction and resilience strategies are a long process, and they may not be complete for every kind of disaster. Additionally, regardless of the typical case of an affected population, natural disasters and shocks occasionally concern areas without an established population, such as land owned by local individuals or households for agricultural use. If so, social protection registries should be combined with geo-location data for cadasters to compensate for the affected individuals/households.

Section 5.0. Early Warning Systems (EWS) – Triggers for Prompt Action

Early warning systems (EWS) are a significant component of disaster risk reduction. They prevent loss of life and reduce the economic impact of natural hazards (Unesco,2023). An Early Warning System is defined as "an integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that

enable individuals, communities, governments, businesses, and others to take timely action to reduce disaster risks in advance of hazardous events." (UNDRR,2023). Early warning systems to be "people-centered" and "end-to-end" efficient may include four interrelated key elements: i. systematic collection of data as well as disaster risk assessments for possible disaster risk knowledge; ii. Detection, monitoring, analysis, and forecasting hazards and their potential effects. iii. Dissemination and communication through an official source of authoritative, timely, accurate, and actionable warnings and associated information on the likelihood and impact, and iv. preparedness at all levels to respond to warnings (UNDRR,2023). Coordination is needed within and across sectors and multiple levels for the EWS to work efficiently and to include a feedback mechanism for continuous improvement. A lack of coordination across them or a failure in one component can lead to the collapse of the entire system (UNDRR,2023). In addition to EWS, multi-hazard EWS (MHEWS) handle hazards and impacts of similar or different types, which may occur independently, simultaneously, or cumulatively over time, and consider the potential intercorrelated effects. An MHEWS capable of warning one to many hazards increases the consistency and efficiency of alerts through coordinated and compatible mechanisms involving several disciplines for the updated and accurate identification and monitoring of hazards (UNDRR,2023). Increasing the availability of multi-hazard early warning systems and disaster risk information is one of the seven global targets of the Sendai Framework (Figure 12) for Disaster Risk Reduction 2015-2030 (Unesco,2023).

Figure 12. Seven targets of SENDAI Framework (Source: UNDRR.org, 2023)

Economic crises and conflicts are considered hazards and shocks that need to be addressed under the SENDAI framework. Existing early warning systems and climate forecasts generate data that can be utilized to develop triggers for instant responses, including financial support for the affected (Bastagli & Harman,2015; O'Brien et al.,2018). When pre-settled conditions are met, these triggers initiate prompt actions based on predefined scenarios and can accurately analyze and interconnect natural event forecasts to potential outcomes. Nevertheless, they can be utilized as the prime source for the ex-post decision-making process for early action (Wilkinson et al., 2018). EWS, which adopt a probabilistic forecast approach, are based on data from different geographical sources, including regional, national, and international centers. These data are complemented with data from other sources (e.g., hydrological data and data on food production) and data from national agencies and global assessments, concluding a final assessment status on the potential risk for each specific situation (Wilkinson et al.,2018). In the case of slow-onset shocks, there is a link between the social protection response and EWS; for instance, this occurs in Pakistan and the Dominican Republic (Watson et al.,2017; Beazley,2017; Barca & Beazley,2019). The critical questions for these types of shocks are: "When can a gradually worsening situation be classified as an emergency?" and "What is the crucial point in initiating aid giving?" (OPM,2015). Both challenges are associated with establishing specific triggers, particularly in the case of recurrent or seasonal shocks. These triggers could be pre-defined early warning indicators, such as those in the third Northern Uganda Social Action Fund (NUSAF III), where a horizontal expansion is initiated automatically in case of natural disasters to support vulnerable households financially. It was implemented in 2016, when approximately 25,000 households were funded during a drought caused as a side effect of El Nino in the Karamoja region, Northern Uganda (Maher & Poulter,2017). Another type of trigger is the vegetation condition index in Kenya, which automatically activates the expansion of the HSNP cash-transfer program. It uses remote sensing satellite data that denotes predefined categories of drought risk. If the risk is categorized as severe, adequate resources are allotted to the affected regions, enough to scale up to 50% of their population. In contrast, if the risk for drought, based on the vegetation condition index, is considered extreme, the allocated resources allow scale up to 75% (OPM,2017). In April 2015, it was the first event of cash transfer expansion "with over £3 million being disbursed to 90,000 temporary beneficiary households" (Barca & Beazley,2019) within two weeks. The vegetation condition index was considered a valid trigger after its first implementation (Slater et al.,2015),

and several emergency payments have been made to vulnerable households since then (OPM,2017). Furthermore, an EWS is triggering a risk-financing mechanism (RFM) for scale-up in response to a shock in Ethiopia's Productive Safety Net Program (PSNP). An early implementation in 2011, during a drought event, allowed both types of expansions: a horizontal expansion where 3.1 million additional beneficiaries received financial support for three months and a vertical expansion where 6.5 million existing beneficiaries received financial support for three extra months (Slater & Bhuvanendra,2014). However, there are cases in which EWS are used to initiate financial support for natural disasters that are not associated with social protection programs (Barca & Beazley,2019). In Pacific Island countries susceptible to weather-related shocks, the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) has been piloted since 2013 (OPM,2017). Another example is the Caribbean Catastrophe Risk Insurance Facility (CCRIF), which delivers financial support to member states using index-based parametric insurance (Beazley et al.,2016). Barca & Beazley (2019) expressed the view that several prerequisites should be considered in EWS triggers, and several of these are presented in (Table 2).

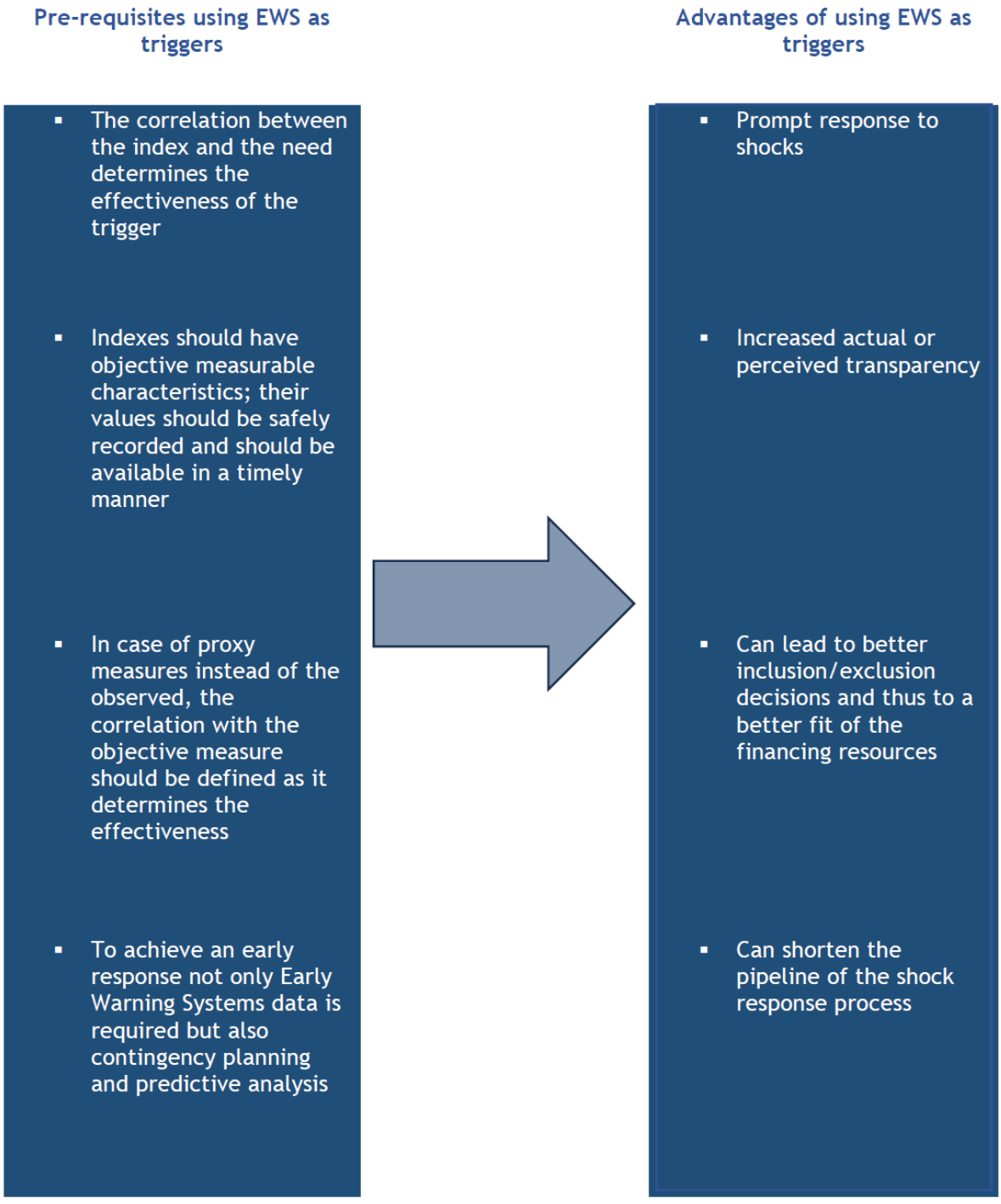
Section 5.1. Enhancing Emergency Response through Internet of Things (IoT) Technology

In our era, most devices can be Internet-enabled, infusing them with additional computing power and analytic capabilities that make them "smart." In addition, connectivity has exponentially increased between different entities (human to human, human to object, object to object), establishing a hyper-connected society (Yao et al.,2015). More complex and advanced systems are emerging by connecting Internet of Things (IoT) devices and environments, often in real-time, providing new capabilities. The Internet of Things (IoT) can play a pivotal (yet underutilized) role in contemporary emergency responses, unlocking the potential for swift aggregation and analysis of information during critical events. This technology significantly improves the identification and communication of shock events while suggesting crucial actions. Incorporating IoT applications enables real-time insights by merging precise location data with local video and social media, delivering immediate context during shock events, and transitioning to a timely prevention model from analysis to action (Meyers et al.,2015). Citizens can also actively participate in emergency

response, acting as human sensors by reporting events in their proximity and emphasizing shared responsibility (PulsePoint,2024). Organizations also benefit from IoT technologies that offer immediate feedback, fostering improved decision-making. However, this requires orchestrating a complex system of sensors, processors, and actuators (Meyers et al.,2015). As IoT-generated data aggregates information from diverse sources, it becomes imperative for governments and organizations to champion and implement common data standards, ensuring interoperability (Meyers et al.,2015). Moreover, IoT applications enhance response coordination by capturing specific impacts through real-time measurements, enabling A/B testing and informed decision-making in critical situations. This empowers individuals to act based on reliable information during shock events (Meyers et al.,2015), further emphasizing the transformative potential of the IoT in emergency scenarios. Another promising technology under this framework that could enhance timely responses is the emerging Social Internet of Things (SIoT) paradigm. SIoT provides a global platform for interconnected objects to establish social relationships, prioritize common interests, and deliver improved user services (Rho & Chen,2018). This interconnected ecosystem facilitates intellectualized objects to autonomously understand human situations and needs and offer relevant information to support individual and organizational efficiency (Yan et al.,2015). The expansion from the individual level to the organizational level, coupled with the integration of IoT, facilitates additional functional collaboration (Babar & Arif,2017; Yuan et al.,2017). These collaborative potentials hold promise, particularly in the early shock-response domain. In this environment, mutual information flows dynamically, surpassing simple sharing and reading levels. The accelerated growth of SIoTs as a popular future application paradigm can be attributed to advancements in IP-enabled embedded devices, smart objects, communication technologies, and big-data tools (Yuan et al.,2017). These advancements contribute to key aspects, such as network navigability, scalability, trustworthiness evaluation, service composition, object discovery, and behavior prediction (Rho & Chen,2018). However, while Internet of Things (IoT) device data open pathways for novel insights, they simultaneously introduce new layers of social complexity. The widespread availability of these data holds the potential for discrimination through the utilization of algorithms that automatically categorize and make decisions, often without consideration of the underlying social and economic factors. (Gangadharan,2014). Recognizing and comprehending these social risks at the outset is crucial for designing socially responsible public IoT applications.

A proactive approach to understanding and addressing these complexities is imperative to ensuring the effectiveness and fairness of IoT applications in the adaptive social protection domain.

Table 2. Pre-requisites and advantages of using Early Warning Systems (EWS) as triggers

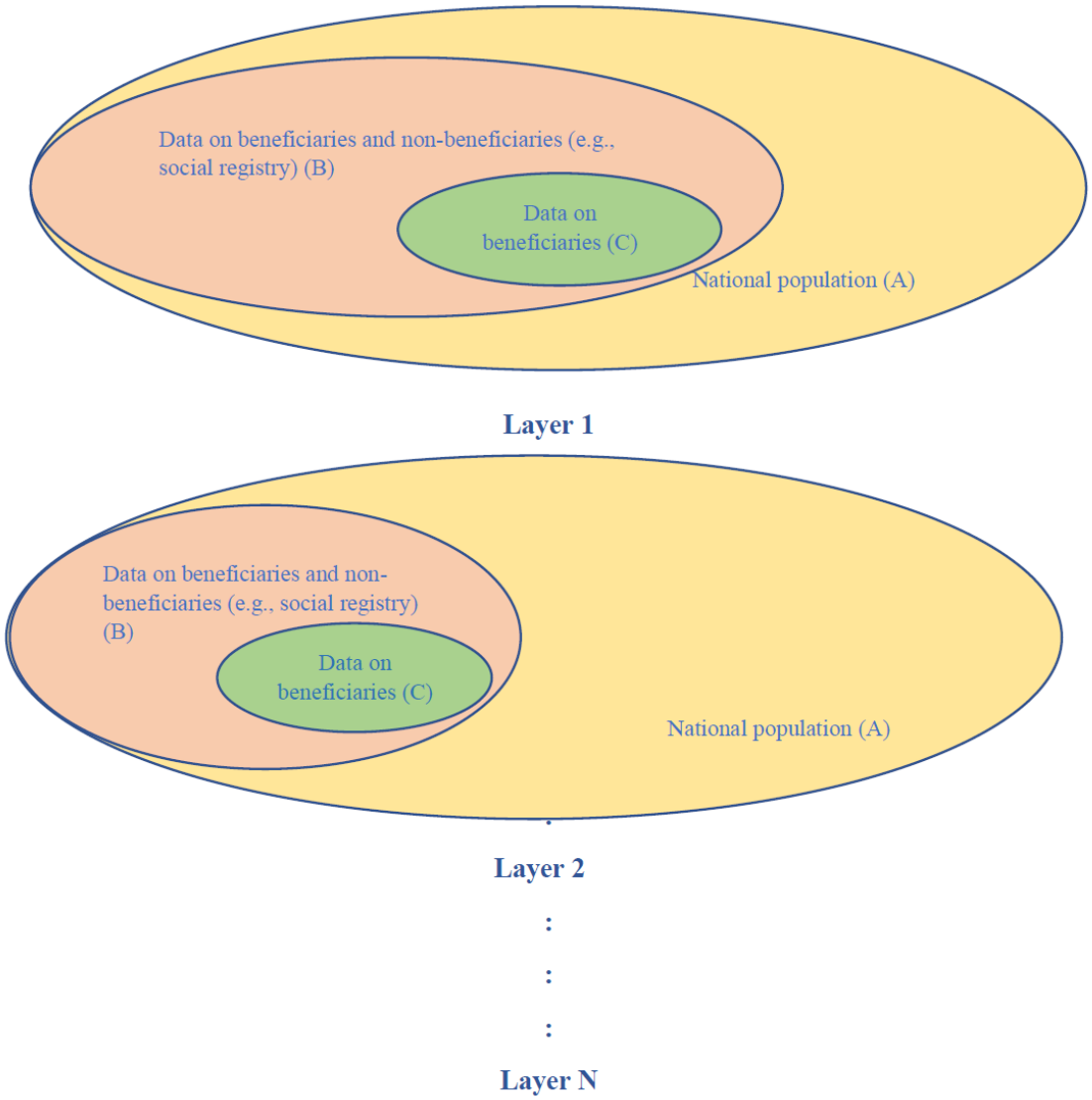


(Source: Adapted and based on Barca et al.,2019; Bastagli & Harman, 2015; Bailey,2012 and Levine,2011)

Section 6.0. Are the Existing Social Protection Information Systems Qualified for an Adaptive Shock Response?

Usually, there are no specific data and information systems for shock response purposes; thus, leveraging existing data and information systems should provide the flexibility and the competence for scale-up in the aftermath of a shock. All modern approaches to adaptive social protection (or shock-responsive social protection, as given by O'Brien et al. (2018), can provide top-ups via "vertical" or "horizontal" expansion processes using beneficiaries' or potential beneficiaries' data, respectively. Moreover, new social protection programs are built on the foundations of existing social protection information systems (Barca & O'Brien, 2017). However, the affected population is not always included in beneficiaries' or potential beneficiaries' registries (Barca & Beazley,2019).

Chart 5. Social protection data levels and layers



(Expansion based on Barca and O'Brien, 2017)

The national population (A) in Chart 5 is the individuals/households not included in existing registries and, thus, are less easily reached through horizontal expansion. Social registries (B) include households/individuals who could be either beneficiaries or non-beneficiaries, and their primary purpose is not to design the response to shocks; here, horizontal expansions are possible and easy to implement. Data on beneficiaries (C) includes individuals/households eligible for routine social protection programs, as they are the most vulnerable. Vertical expansion is a

common practice in this case because the receivers are well-defined. In Chart 5, different layers represent different social protection programs in the same country that cover different needs. The beneficiaries' set is not the same in every case. If the coverage persists among different layers, the confidence is higher in defining that part of the population as definite beneficiaries.

Section 6.1. Tools for Socioeconomic Assessment in Social Protection Programs

Efficient socioeconomic assessment in social protection programs relies on advanced tools to accurately evaluate households' financial needs. The automated tools available include Means Testing (MT), which involves income and asset assessments and utilizes self-reported or externally verified data through systems interoperability. Verified means tests are prevalent in OECD countries, emphasizing labor market formality and robust system interoperability. Proxy Means Testing (PMT), which estimates socioeconomic welfare using composite measures based on observable household characteristics, and utilizes proxies such as demographic structures, education levels, location, dwelling quality, and ownership of assets. The PMT is suitable when measuring actual income and consumption, is challenging. Hybrid Means Testing (HMT) is a combination of these two tools. HMT gathers information on observable income and certain household assets and estimates income or consumption by combining verifiable and imputed income, particularly useful in Eastern Europe and Central Asia (Tesliuc et al.,2014). Community-Based Targeting (CBT) also prioritizes household registration and validates income and consumption scores. CBT leverages local knowledge, often provided by community leaders, to assess needs and conditions and enables direct ranking of families from the richest to the poorest within a community. These tools ensure a comprehensive assessment, ranging from formal income verification to subjective community-based insights. Their application can be demand- or administrator-driven, offering flexibility in evaluating the status of registrants in terms of income, asset value, or absolute PMT score. Integrating these tools enhances the accuracy and fairness of socioeconomic assessments in social protection programs. Moreover, customized versions of these tools are also used, such as the "light" PMT (LPMT), including a few critical variables as the highest predictors (World Bank,2017), as well as the combined use of more than one tool (Lindert et al.,2020).

Section 6.2. What Data Type is Ready for Use in the Aftermath of a Shock?

Section 6.2.1. Beneficiaries' Data – Use Cases

Beneficiaries affected by a shock can be reached rapidly compared to other groups, and if needed, vertical expansions can be performed promptly. Databases for specific social programs are frequently up-to-date compared to social registries, and these databases contain ready-to-use data and functional information such as addresses, contact details, bank accounts, and family members. (Barca & O'Brien,2017). However, it is uncommon for routine social protection programs to include most of the population in an area. Beneficiaries are usually the most vulnerable of all in a specific geographical location, and this can lead to several difficulties when regions with either low or no coverage are affected by a shock. Therefore, adopting approaches focusing only on beneficiaries and vertical expansions to support them could steer misplaced decisions on indeed affected individuals/households (false negatives). Respective experiences have been proven in several countries. In Lesotho, during the 2016 droughts, those estimated to have faced survival deficiencies (an estimation that was based on food security data) was, on average, 28% of the individuals that lived in "Child Grant Program" households throughout the affected zones (high regional differences were observed, too) (Kardan et al.,2017; Barca & Beazley,2019). Vertical expansion in such a situation would direct resources in the wrong direction. Another example of the mismatch between existing registries and the population affected by a shock occurred in Ecuador in the aftermath of the 2016 earthquake, where only 15% of the affected households were beneficiaries of the country's social assistance program (Bono de Desarrollo Humano) (Beazley,2017a; Barca & Beazley,2019). In Mozambique, the median population affected by the 2016 droughts in the 71 districts was more than the median population covered by the country's most extensive social assistance program (Basic Social Security Program, PSSB), indicating that there were still households in need in the aftermath of the droughts (Barca et al., 2017; Barca & Beazley,2019). The experience of these events implies that not only can the accuracy of a shock response not rely on monolithic beneficiary databases and social registries, but there is also the need for a different and flexible inclusion targeting the design of social protection information systems. Another conclusion could be that vertical expansions can be implemented successfully, mostly when the affected population is well-defined and probably geographically bounded. It

would be in the correct direction if the accuracy of a shock response (a widely accepted definition should be settled here) could be measured, considering the shock's effect, the case's targeting criteria, and the final implementation. Nevertheless, Barca & Beazley (2019) indicated that strategies exist to mitigate shock response events through vertical expansion across multiple programs (if beneficiary databases exist). Similar cases have occurred in Argentina, including floods, wildfires, volcanic ashes (Beazley et al.,2016), Fiji – cyclone Winston (Mansur et al.,2018), and Peru floods (Beazley,2018). Additionally, other affected individuals/households could be helped through complementary programs, as occurred in the aftermath of Typhoon Haiyan in 2013 in the Philippines (Smith et al.,2017; Barca & Beazley,2019). Some authors hypothesize that the beneficiary data can also be used for exclusion apart from inclusion since they already receive support through routine social protection programs (Barca & Beazley,2019). However, they conclude that this needs special attention in its application because the funding for humanitarian aid is often higher than that for ordinary social protection (O'Brien et al.,2018).

Section 6.2.2. Non-beneficiaries' Data – Use Cases

Registries containing data on non-beneficiaries can be the basis for delivering immediate support to affected individuals/households in areas where a shock occurred by applying a horizontal expansion. Additionally, data on non-beneficiaries can help several types of shock responses as a further information source that can be combined and integrated into existing data (Barca & Beazley,2019). Among other variables, the social registry coverage of a country's population could determine the potential of using recorded non-beneficiary data as the first approach in the aftermath of a shock. In countries like Lesotho and Mozambique, where social registries are not updated, are not fully accessible, and have limited coverage (Kardan et al.,2017a,b), using existing non-beneficiaries data to a shock response is not recommended. In contrast, Latin America has countries with high population coverage in their social registries. Households affected by shocks in Chile were already included in the social registry at a high percentage (90%); in Peru, the rate was 80% in the 2017 floods, and in Ecuador, 66% of the affected households in the 2016 earthquake were already in the social registry (Beazley,2019; Beazley,2018; Beazley, 2017a). Response timeliness and cost-effectiveness have been identified as critical factors in the aftermath of a shock. However, few comparative studies have been performed to clarify the advantages and disadvantages of different approaches to the shock response. In 2016, the International Rescue

Committee (IRC) carried out a research project in Sindh province, Pakistan, to investigate the use of an existing database used as a social registry (NSER), which had over 85% coverage of the national population in comparison with the use of community-based targeting (CBT) data collection method. The results indicate interesting aspects and differentiations; while both methods had similar cost efficiency, the use of the existing social registry had a higher level of operational efficacy, more than twice faster; however, this can be achieved only if data sharing Momentum of Understanding's (MoU) are in place. Moreover, using the poverty score in the communities, pulled from the social registry (NESR) for identifying and registering the most vulnerable households, resulted in similar targeting accuracy as the community-based targeting (CBT) method. In countries where climate shocks occur frequently, humanitarian aid is provided, and its presence increases over time. One case that falls into this category is Malawi, where humanitarian aid (MVAC) is elevated due to climate shocks. MVAC operations and processes exist parallel to the country's social registries. The affected population is registered by MVAC using community-based targeting (CBT) each year. However, CBT is carried out by different humanitarian organizations with no standard protocols and architecture, which in turn causes noise and uncertainty in the net recording of the population that receives MVAC aid each year. Since routine social registries are used concurrently during humanitarian aid, a comparative study was developed (referred to as 'trial UBR-MVAC') to investigate the outcomes of using, in parallel, the existing social registry (Unified Beneficiary Registry - UBR) for targeting affected households entitled to humanitarian support. This trial was implemented in a region where affected communities lived, and a ranked list pulled from the UBR, with the Proxy Means Testing (PMT) method within the communities, was used, so the criteria were based on usual humanitarian features. Moreover, under this trial, humanitarian organizations could verify and update variables regarding the affected households and expand the list of households not included in the UBR by updating it. The trial results showed promise, as already existing data hastened the humanitarian response, particularly during crucial phases, such as registration and data entry, and fostered coordination among the involved entities. Additionally, the use of the existing social registry aided community targeting and made the intervention of official authorities less conspicuous. However, it was concluded that the PMT method utilized for targeting UBR was unsuitable for humanitarian responses as it did

not accurately predict the resulting food insecurity.[4] Additionally, it was found that while the demographic data were helpful in humanitarian response, the 'dynamic' ones (those that changed over time) were not updated and couldn't be used for household targeting at the initial stage of the process. The comparative trial's conclusion to achieve an advanced implementation and use was that MVAC should be upgraded to an information system registry that could be used by all partners and apply interoperability with the UBR. (King & Tranchini,2017; IRC,2016; Barca et al.,2019).

In several cases, existing non-beneficiary data have been used for horizontal expansions, although this scheme has yet to be widely applied. The HSNP program in Kenya implemented a pre-enrollment of most households within a defined region (four counties), with open banks accounting for them. However, many were not eligible for funding support. This approach significantly prepared the horizontal expansion in shock events, bypassing the initial and time-consuming registration and data collection stages in the aftermath of a shock. Moreover, this strategy can add degrees of freedom for scale-up (O'Brien et al.,2018). Barca et al. (2019) define the term 'hybrid horizontal expansions' for horizontal expansions that do not include new beneficiaries but re-incorporate beneficiaries that either had graduated from the program or were eligible and were living in the affected areas however, they were not in the program before the shock. In a related case, Peru implemented the social pension plan, Pension 65, which incorporated eligible individuals in the affected flood areas in 2017 who were not in the plan before the shock (Beazley,2018). Furthermore, in response to the 2017 earthquake in Mexico, conditional cash transfers, referred to as PROSPERA, re-incorporated households that resided in the affected areas even though they had already graduated from it (Beazley et al.,2019). Non-beneficiary data can also inform data-gathering procedures in the aftermath of a shock, as occurs in the Philippines using the Listahanan database and in Chile by utilizing the Registro Social (Bowen, 2015; Barca & Beazley, 2019).

[4] Alternatives to Proxy Mean Testing can be found in Household Economy Analysis, (Pascal Schnitzer, 2019) and in The Republic of Congo's Lisungi program mid-term review report (2017), where the "light" version of PMT (LPMT) is implemented. Here, the questionnaire is based on a reduced version of the PMT formula, including few key variables that are the highest predictors. In Sierra Leone's Simplified Community-Based Targeting Processes for Rapid Ebola Social Safety Nets, (2014) a simplified CBT is used.

Section 7.0. Post Disaster Needs Assessments (PDNAs) – A Broad Tool

The coverage of both beneficiaries and non-beneficiaries is not guaranteed in the wake of a shock, and further details are usually required to access those in need. In addition, shocks lead to rapid changes in households' circumstances, so data on their new conditions is needed. Recognizing the need for coordinated post-disaster assessments, the European Union (EU), World Bank (WB), and United Nations Development Group (UNDG) collaborated in 2008 to harmonize assessment methods, leading to the creation of the Post-Disaster Needs Assessment Guide (PDNA) in 2013 (PDNA, 2013). This guide, subject to constant revision, is a collaborative platform for analyzing and planning recovery processes. PDNAs utilize existing methods to conduct impact assessments, encompassing various entities, such as individuals, communities, civil society, governments, and a country's physical assets and infrastructure. While comprehensive, PDNAs are not intended to replace the advanced tools developed by specific agencies. The primary objective of PDNAs is to assist governments in assessing the full extent of a disaster's impact and formulating an actionable and sustainable Recovery Strategy for mobilizing resources (PDNA, 2013). PDNAs operate as government-led and owned processes involving national and international actors (Table 3), necessitating effective assessment and strategy development coordination. Encouraging the participation of affected local communities, authorities, civil society, and the private sector in the design of the Recovery Strategy is crucial, along with the involvement of international entities, including NGOs and donors.

Table 3. National and International entities participate in PDNA

National Entities	International Entities
➢ Presidential Office or equivalent ➢ The Ministry of Finance ➢ The Ministry of Planning or equivalent ➢ Line Ministries ➢ Civil defense ➢ Governors, senators, and mayors ➢ National Red Cross ➢ National NGOs ➢ Civil society organizations ➢ Community-based organizations ➢ Affected population ➢ Private sector	➢ EU ➢ WB and other IFIs ➢ UN agencies ➢ Other bilateral donors ➢ International NGOs ➢ Regional International Organizations

(Source: Adapted from PDNA, 2013)

The main components of PDNAs include pre-disaster context and baseline information, assessment of disaster effects and impacts, and formulation of a Recovery Strategy detailing sector-specific recovery needs. The pre-disaster baseline information stage compares the pre-disaster and post-disaster conditions in terms of economic, social, financial, political, and cultural aspects. The assessment of disaster effects encompasses evaluating damage to infrastructure and physical assets, disruptions in access to goods and services, governance disorganization, and increased risks and vulnerabilities. Economic aspects are estimated, including the value of destruction, alterations in service delivery, and economic impacts at the micro and macro levels. Human development impact analysis focuses on the quality of human life in the medium- and long-term after a shock.

The recovery needs to be identified in the previous stages shape the Recovery Strategy (Figure 13), defining early, medium, and long-term recovery interventions. Baseline data are crucial for determining the impact of disasters on human development and understanding the vulnerabilities and causalities of disasters. When pre-disaster data are lacking, estimations based on comparisons with non-affected areas serve as an initial state for designing the recovery process. Importantly, gender and age analyses are integral to assessing a disaster's effect and addressing the potential vulnerabilities of women and children. Awareness of equal women's participation in decision-making during the recovery strategy stage (Figure 13) is recommended, acknowledging the importance of inclusivity and safeguarding the most vulnerable from further exposure to risk (PDNA, 2013). Gender and disability introduce elevated risks of exclusion from social protection programs. Nevertheless, intentional design in information systems can convert these challenges into opportunities, fostering inclusion and customizing responses for the specific needs of women, children, and persons with disabilities (Barca et al.,2021). Information systems should emphasize explicitly addressing and mitigating gender- and disability-related barriers to ensure inclusivity. Deliberate choices during the design and implementation phases prevent systemic discrimination (Barca et al.,2021), and strategies tailored to reach diverse groups to ensure accessibility and remove obstacles are essential. Additionally, there should be heightened sensitivity to gender- and disability-related requirements. Processes should be streamlined to consider diverse needs, and inclusive evaluation mechanisms should be incorporated to gauge program effectiveness. The lack of disaggregated and analyzed data perpetuates invisibility, contributing to ignorance regarding inclusion requirements (Barca et al.,2021).

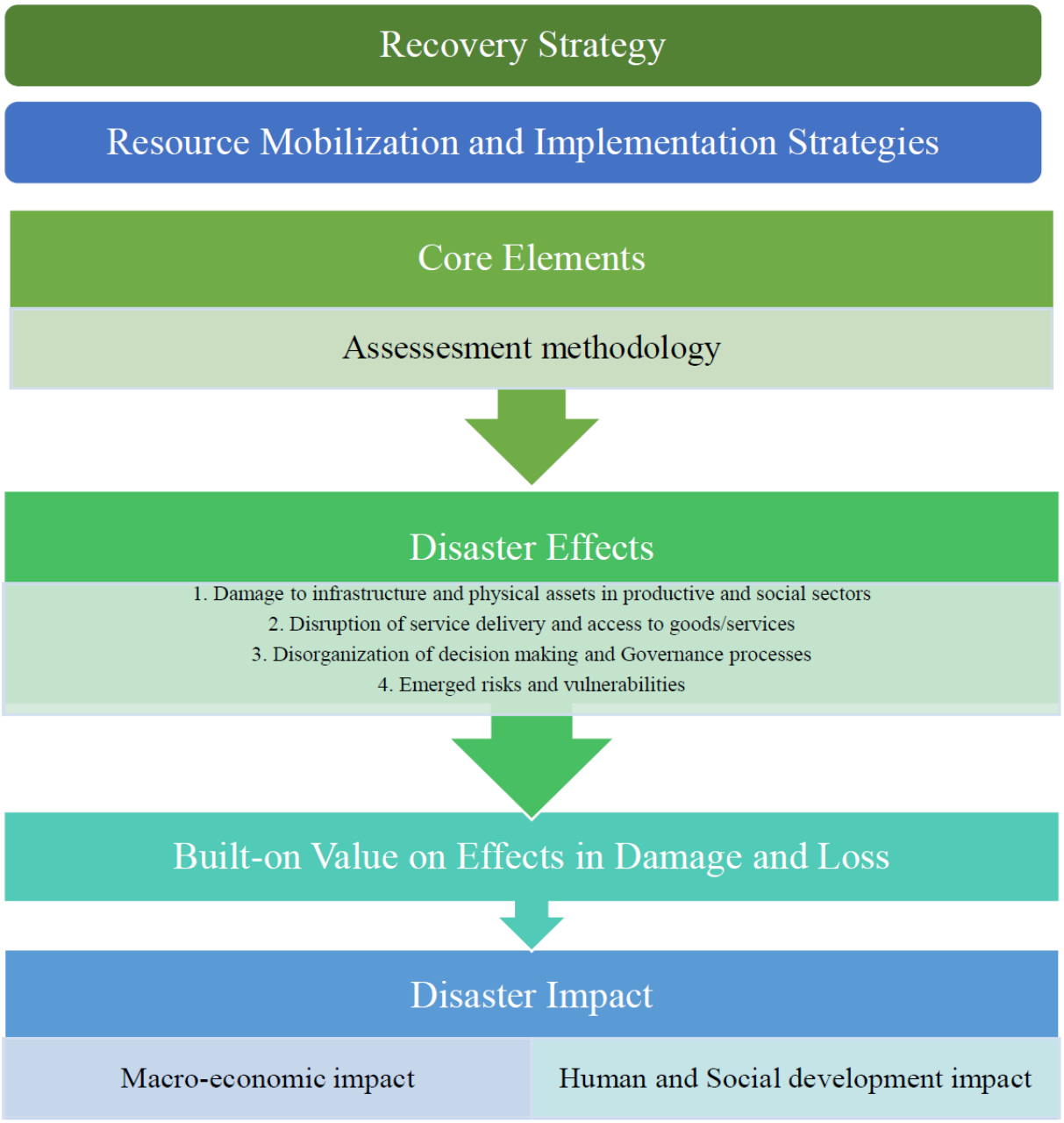


Figure 13. Recovery Strategy process (Source: Adapted from PDNA,2013)

A pivotal aspect within Post-Disaster Needs Assessments (PDNAs) is the comprehensive evaluation termed "capacity assessment." These assessments play a crucial role in redefining governance functions and processes and ensuring the delivery of basic services. Reviewing post-disaster capacities involves assessing their equivalence to pre-disaster capacities and acknowledging any new capacity needs that may arise due to the disaster. These insights are

essential for effective integration in recovery strategy planning. Capacity assessments focus on two main categories: functional capacities, encompassing the establishment and management of legislation, policies, programs, and strategies, and technical capacities, relying on specific professional knowledge in sectors such as health, infrastructure, and education. PDNAs also analyze the increased risks and vulnerabilities that emerge post-shock. This includes a nuanced examination of pre-disaster risks that intensify after the event (Table 4) and identifying new risks. Sector-specific analyses are imperative, revealing potential gaps in policies and procedures and highlighting the absence of measures to protect assets and infrastructure. This may involve mapping risks, imposing regulatory measures for rebuilding risk zones, and utilizing information systems and human resources for effective restoration.

Table 4. Pre-disaster and post-disaster risks and vulnerabilities

Pre-disaster and post-disaster risks and vulnerabilities
▪ Movement of Internally Displaced Persons (IDPs) to areas of greater risk
▪ Increased instability of slopes or elevated flood hazard along river basins and low coastal areas
▪ Continuing heavy rains or further tremors
▪ Potential disease outbreaks
▪ Chronic malnutrition
▪ Possible exposure to sexual and gender-based violence
▪ Possible exposure to child labor/child abasement
▪ Possible exposure to human trafficking
▪ Social-political risks (including conflict risk)

(Source: Adapted from PDNA,2013)

Table 5. Pre-disaster and post-disaster data and related sources useful for the collection

Type of Data	Source of Data
Total population	Most recent population census
Population density per sq Km	The most recent household survey
Age range description	
Urban/rural population	
Male/female-headed households	
Literacy rate (female/male)	
School enrolment	
Life expectancy	
Human Poverty Index - HPI	Human development reports or other national or international estimates
Human Development Index - HDI	Human development reports
Per Capita income	Annual economic and social surveys
Urban/rural poverty	Economic, social, and financial reports
Access to potable water	
Existence of communicable diseases	
Gender-based violence/crime	
Child abasement	
Human trafficking	
Refugees' migration	
Infant Mortality Rate - IMR	Millennium development reports or sectoral indicators from relevant ministries

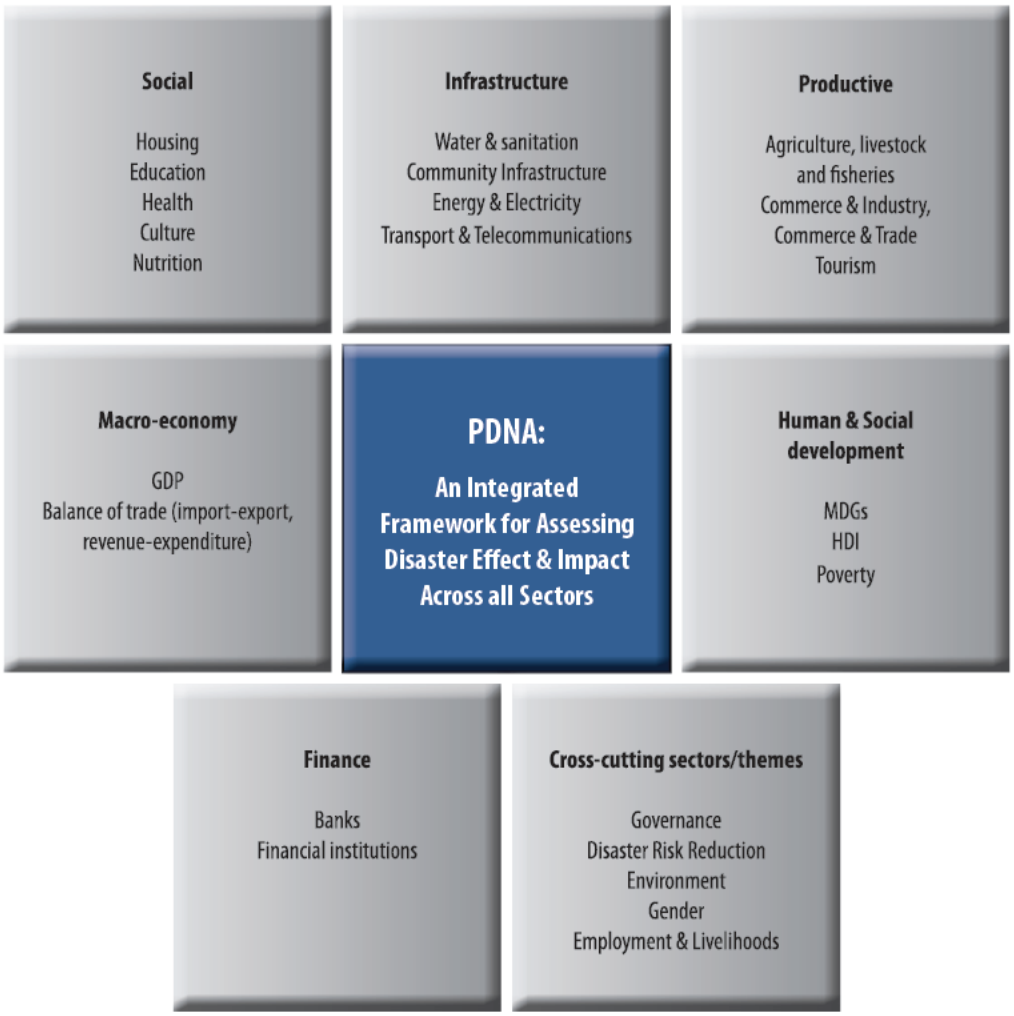
Maternal Mortality Rate - MMR	Millennium development reports or sectoral indicators from relevant ministries
	Satellite imagery with geo-referenced data
	General maps of the country (including affected areas)
	Annual report of utilities
	Economic and financial reports
	Production forecasts

(Source: non-extensive list, adapted from the PDNA,2013)

Section 7.1. PDNA Estimation for the Economic Value of Disaster Effects

In the economic estimation of disaster effects, PDNAs initially quantify losses in physical terms, transitioning to their monetary value based on market prices before and immediately after the shock. Economic losses encompass disruptions in sectors (Table 6), such as agriculture and industry, and reduced revenue, although some sectors may experience increased revenue, such as construction (PDNA,2013). Macro-, medium-, and long-term impacts are assessed, including income losses, employment instability, and the well-being of affected individuals and households. Macroeconomic variables, such as GDP, balance of payments, and fiscal sector indicators, inform the analysis, with a focus on potential emerging inequalities.

Table 6. The typical sectors that are assessed in the PDNA



(Source: Global Facility for Disaster Reduction and Recovery, United Nations, PDNAs, Volume A, Guidelines, 2013)[5]

PDNAs extend their analysis to human development impacts, recognizing that shock effects persist long after physical reconstruction. Measures such as the Human Development Index (HDI), Multi-Dimensional Poverty Index (MDPI), and Gender Inequality Index (GII), along with frameworks such as the Millennium Development Goals (MDG) and post-Sustainable Development Goals (SDG), guide the assessment of human development. Indicators such as access to clean water, education, and primary healthcare are employed, with emphasis on the most vulnerable

[5] Millennium Development Goals – MDG, Human Development Index – HDI, Gross Domestic Product - GDP

populations. The qualitative aspects of disaster impact, encompassing dignity, justice, and psychological well-being, are acknowledged, although challenging to measure directly. These qualitative dimensions are considered during PDNA analysis and if necessary, Human Development impact assessments are performed post-PDNA, with conclusions integrated into the Recovery Strategy phase (PDNA,2013; PDNA,2015).

Section 7.2. PDNA Shock Recovery Strategy

The Recovery Strategy represents the pivotal phase in which sector-specific reporting of damages, losses, and needs is consolidated. It establishes priorities, costs, stakeholders, and a timeframe for recovery (Table 7). This phase, a crucial link between assessment outcomes and recovery frameworks, is led collaboratively by the national government, United Nations agencies, the World Bank, NGOs, and donors. Sectoral recovery interventions identified in this phase feed into subsequent Recovery Frameworks and, ultimately, into the final stage of the Recovery Plan.

Table 7. Key objectives of the PDNA Recovery Strategy

Key objectives of Recovery Strategy
Mobilize stakeholders
Facilitate inter-institutional coordination
Establish parameters for joint action planning
Identify priorities
Establish a calendar of recovery actions
Establish good practices
Promote national ownership of the recovery process
Promote an equity-based, participatory, and inclusive recovery process
Articulate the fundamentals for reducing risks and for building back better (BBB)
Estimate the cost of recovery
Provide the basis for a recovery framework that will lead to the detailed implementation plan
Serve as a tool for resource mobilization with donors

(Source: PDNA 2013, adapted)

Aligning with each country's overarching development plan, the Recovery Strategy may prompt reconsideration and updating of the national development plan post-shock. Assessment results are presented by sector and geographic area to offer a comprehensive view of recovery needs, facilitating region-wise comparisons and prioritization. The categorization of recovery needs to guide specific and accurate actions chronologically. The Recovery Strategy integrates four main processes: i. the reconstruction of damaged infrastructure and physical assets, ii. recommendations for production, service delivery, and access to goods and services, and iii. the restoration of governance and decision-making processes; and iv. risk reduction (PDNA,2013). However, these processes are interconnected, involving both the public and private sectors, thereby increasing complexity and operational costs.

Table 8. The elements of the recovery needs and the related costs for each

Components and costs for recovery needs	
Components	**Cost**
Reconstruction of infrastructure and physical assets	**Reconstruction needs are calculated as follows: Value of Damage + Cost of (Quality improvement + Technological modernization + Relocation, when needed +Disaster risk reduction features + multi-annual inflation).**
Recommencement of production, service delivery, and access to goods and services	**The costs for recommencement of services are calculated as the additional costs to service providers to restore basic services and the costs to provide Build Back Better (BBB) and equitable and affordable services to vulnerable groups and affected population to access services.**
Restoration of governance and decision-making processes	**The costs for restoration of governance and decision-making processes are calculated as costs for additional human resources with improved technical skills and capacities of service providers to undertake the recovery, costs for replacing lost records and upgrading documents of the various public services, and costs for addressing governance and social cohesion issues if disrupted.**
Reduction of risks	**The additional costs to Build Back Better (BBB) reducing risks and increasing preparedness are calculated as costs for addressing immediate risks, costs for upgrading preparedness measures in each sector, costs for further studies or assessments, technologies, and practices, technical expertise, etc., required to facilitate implementation of building back better approaches and cost for specific measures to strengthen disaster risk reduction.**

(Source: adapted from the PDNA 2013)

Detailed calculations of the recovery component costs are presented in Table 8, recognizing that variations exist based on the disaster and affected country, requiring a case-by-case approach. In Table 9, a sample of assessment data by sector and affected provinces from the Recovery Strategy

in the Dominican Republic illustrates the subcategories and priority levels for reconstruction and the responsible entity.

Table 9. Sample of assessment data integrated by sector and affected province, Dominican Republic Recovery Strategy

Area Affected		Sector														
		Education Facilities			Health Centers			Water			Sanitation			Housing		
Province	Municipality	Total damaged	Partial damaged	Total	Total damaged	Partial damaged	Total	Total damaged	Partial damaged	Total	Total damaged	Partial damaged	Total	Total damaged	Partial damaged	Total
1	a	24	28	52	19	7	26	16	7	23	2	0	2	450	452	902
	b	33	12	45	31	4	35	28	14	44	3	3	6	218	102	320
	c	17	22	39	13	17	30	9	3	12	4	6	10	123	167	290
	d	23	14	37	8	22	30	20	17	37	3	2	5	698	645	1343
	e	12	25	37	9	25	34	4	6	10	4	4	8	440	1125	1565
	g	2	7	9	12	21	33	13	15	28	1	2	3	544	446	990
subtotal		111	108	219	92	96	188	90	62	154	17	17	34	2473	2937	5410
2	a	5	3	8	0	3	3	3	6	9	8	2	10	1768	676	2444
	b	1	3	4	2	3	5	1	3	4	0	2	2	654	1426	2080
	c	0	1	1	7	5	12	1	4	5	0	0	0	1200	1789	2989
	d	2	0	2	2	4	6	0	1	1	2	1	3	2780	2876	5656
subtotal		8	7	15	11	15	26	5	14	19	10	5	15	6402	6767	13169
TOTAL		119	115	234	103	111	214	95	76	173	27	22	49	8875	9704	18579

(Source: UNDP,2008)

The post-disaster recovery plan serves as a roadmap for the recovery process (Figure 14), aligned with national development plans, poverty reduction strategies, global sustainable development goals, and international human rights commitments (PDNA,2013). Guiding principles for recovery have been introduced to enhance effectiveness, transparency, accountability, and coordination among stakeholders, emphasizing inclusion, equity, accessibility, transparency, and coordination (PDNA,2013).

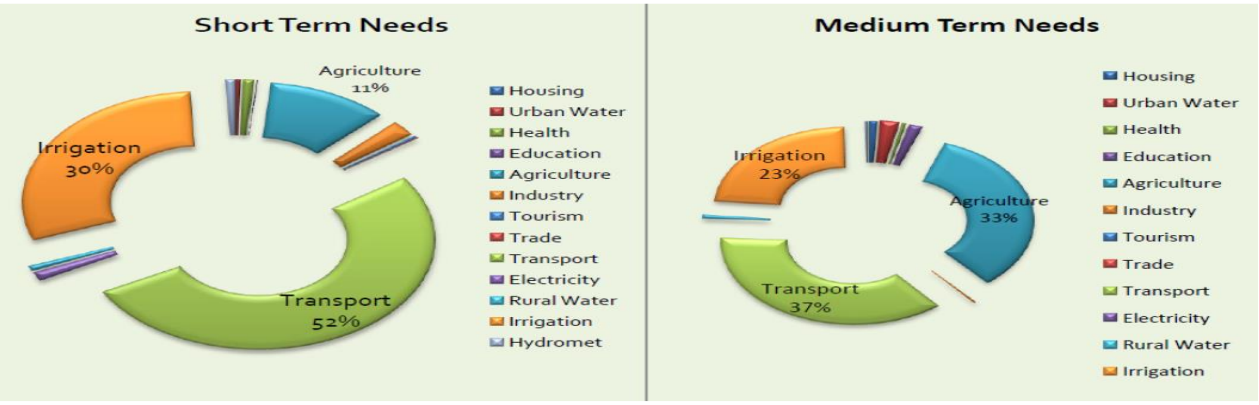


Figure 14. Integrated data sector-wise at the national level (Source: Global Facility for Disaster Reduction and Recovery, United Nations, PDNAs, Volume A, Guidelines,2013; Typhoon Haima Joint Damage, Losses, and Needs Assessment (JDLNA), 2011

Section 7.2.1. PDNA Sector Recovery Strategy

The sector-recovery strategy focuses on sector-priority needs and required interventions for specific outcomes. Figure 15 illustrates a scenario for the aquaculture sector's post-disaster recovery. Prioritization is a political decision guided by national priorities, resource availability, and country-specific constraints. Basic considerations, such as population urgency, categorization of needs, and benchmarking, may simplify prioritization.

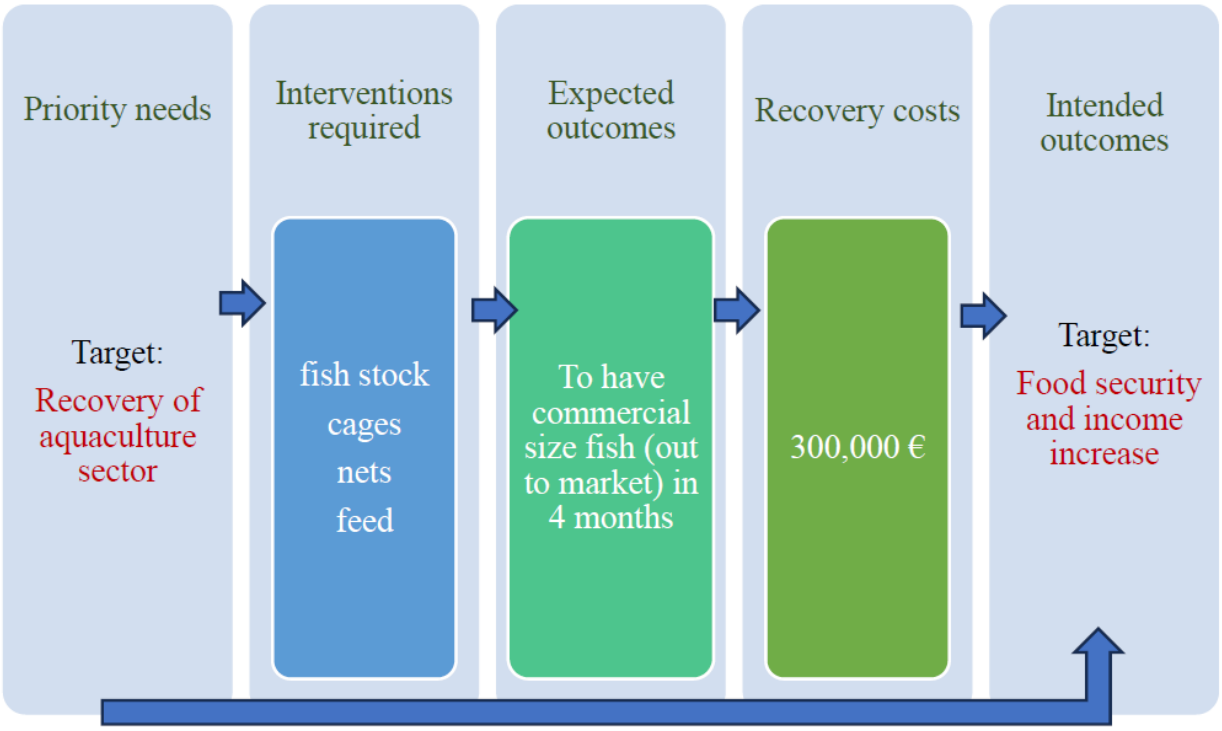


Figure 15. Sector recovery strategy example (aquaculture sector) (Source: adapted from UNDP´s Results Based Framework and PDNA,2013)

Once priority recovery needs are identified, interventions (policies or projects) are implemented across sectors within a specified timeframe (short-, medium-, or long-term; Figure 14) (PDNA, 2013). A crucial distinction lies between intended outcomes, the modifications that interventions aim to achieve, and expected outputs, the products after recovery intervention completion. For example, repairing and rebuilding damaged schools (identified recovery needs) may lead to the construction of schools (intervention), with the attendance rate increasing as the intended outcome and the actual number of repaired or rebuilt schools as the expected outcome.

In implementing a Recovery Strategy, precise cost calculation is essential to prevent double counting from overlapping interventions. To restrain unnecessary expenses, sector collaboration, detailed cost-sharing mechanisms, processes, and intervention announcements are crucial. Inter-sector coordination is vital for mitigating cost inflation and ensuring equilibrium between increased demand and decreased supply during the recovery phase. Optimal cost estimation for reconstruction is advised, considering realistic proportions, available funds, and the country's absorption capacity over a three-year period (PDNA,2013). In cases where replacement approaches are impractical, extensive disasters may necessitate the implementation of megaprojects, contributing to a significant cost increase. Employing Information Management Systems enhances organizational efficiency, facilitates information sharing, and optimizes processing time through inter-operational procedures. The final stage of the Recovery Strategy is the sector implementation arrangements phase, encompassing key elements, such as partnerships, coordination and management, cross-cutting themes, links to development, resource mobilization, and key assumptions and constraints. This phase outlines intra-sectoral and inter-sectoral coordination arrangements and delineates recovery process management responsibilities. In several countries, cross-cutting themes such as age, gender, and HIV positivity are crucial and demand frequent intersectoral cooperation (PDNA,2013). Coordination teams with access to all sectors become essential, ensuring the prompt identification of cross-sector linkages to prevent delays and overlaps in the recovery process.

Table 10. Sectors included in the Damage and Loss Assessment (DaLA) and Human Recovery Needs Assessment (HRNA); in some cases, the cross-cutting themes listed may be stand-alone sectors

Social sectors	Infrastructure sectors	Productive sectors	Cross-cutting themes
Housing, land, and settlements	Water, sanitation, and hygiene	Agriculture, aquaculture, livestock, fisheries	Governance
Health	Community infrastructure, energy, and electricity	Industry, commerce, and trade	Disaster risk reduction
Education	Transport and communication	Tourism	Employment and livelihoods
Nutrition			Environment
Culture			Gender

(Source: adapted from the PDNA,2013)

Section 7.3. PDNA Coordination Structure

The coordination structure (Figure 16) includes a high-level management team, a PDNA coordination team, and sector teams. Emphasizing internal expertise over external entities, the structure simplifies coordination for quick results. The high-level management team oversees the entire process, supported by the fully operational PDNA coordination team, the technical support cell, and the report secretariat.

Section 7.4. PDNA Technical Support Functions

Technical support functions include Information and Communication Technology (ICT), Information Management (IM), Geographic Information Systems (GIS), mapping, logistics, administration, finance, interpretation/translation, and report writing. ICT services ensure high connectivity for data transmission, whereas IM functions support GIS services, data collection, and regular updates. The report-writing function involves gathering, refining, and sharing the

outputs for stakeholder feedback, culminating in a concise summary. Precise data management is crucial for producing comprehensible reports aligned with PDNA (2013) guidelines.

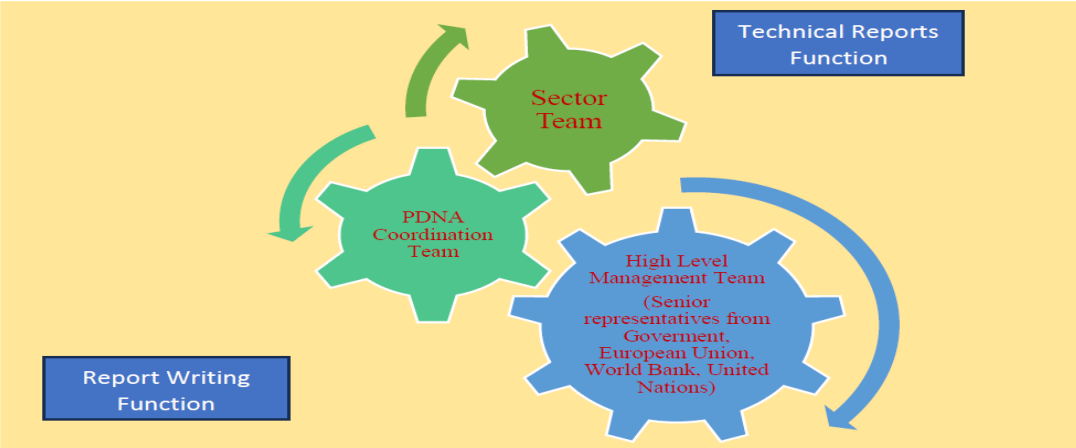


Figure 16. PDNA coordination structure (Source: Adapted from the PDNA,2013)

Section 7.4.1. PDNA Information Management Arrangements – Web Collaborative Workspace

Upon confirming the necessity of PDNA, preparatory measures encompass human resources, logistics, budgets, and training. The key information management arrangements are presented in (Table 11). In the aftermath of disasters, a substantial amount of primary and secondary data is generated, necessitating consolidation and intricate analysis across sectors. Information management systems (IMS) support data collection, processing, analysis, and distribution.

Table 11. PDNA Information Management Arrangements

PDNA Information Management Arrangements
· Web platform for information sharing among PDNA teams (IRP)
· Update the platform with all reports, data, and maps obtained for situation analysis
· Links to existing information management systems (e.g., Humanitarian Information Centers, Survey of Surveys, OCHA, etc.)
· Links to development databases and key analytical documents
· A contact list with the main actors (Government, UN agencies, donors, IFIs, NGOs, etc.)
· Staffing and equipment considerations to ensure information management and analysis

(Source: PDNA,2013, adapted)

A unified online platform, activated by the coordination team as per PDNA (2013) recommendations, functions as a collaborative workspace. An information management specialist or team manages this platform throughout the PDNA life cycle. It hosts crucial reports, maps, and foundational data, as the checklist in Table 12 indicates. The PDNA information management system leverages national, humanitarian, and early recovery information systems, establishing connections with pre-existing frameworks such as the OCHA Humanitarian Information Centers and Survey of Surveys (SoS). The PDNA web-based collaborative workspace is vital for communication and coordination at different engagement levels. It acts as a repository to share and store data throughout the PDNA process. Accessible to various stakeholders, the workspace includes PDNA Team members, the UN Country Team, government officials, and international partners. The International Recovery Platform (IRP)[6] facilitates the setup of a dedicated workspace with template pages designed for easy content input. Access within the workspace is categorized into three levels: administrator, moderator, and reader, each with specific permissions. Guidelines for using the workspace can be found on the International Recovery Platform website[7].

[6] https://recovery.preventionweb.net/

[7] http://www.recoveryplatform.org/pdna/user_manual_for_workspace

Table 12. Data and potential sources

Data and Reports to Collect	Possible Sources of Information
All pertinent situation reports and rapid assessment findings, including global and sectoral data	Sectoral reports from various agencies
Maps depicting affected regions, population displacement, IDP camp locations, etc.	Geospatial data repositories
Satellite images covering impacted areas	Satellite imagery providers
Administrative maps of the nation and affected geographical areas	Government archives, cartographic resources
Relevant contingency plans, both government and inter-agency	Official government sources
National reports like human development, UNDAF, PRSP	Official national reports
Organizational charts for in-country UN presence and government structure	Official UN and government sources
United Nations security guide	UN security resources
Hazard maps and historical disaster records	National disaster management agencies
Baseline socio-economic and demographic data for affected regions	Government records, statistical bureaus
Comprehensive contact list of PDNA Team members	Coordination Team records
Contact information for sector ministries, Civil Defense, National Operations Centers, National Red Cross	Relevant government agencies, humanitarian organizations
Reports from media outlets	News agencies, press releases
Statements from local authorities	Local government offices
Reports by UN agencies	Official UN agency publications
Data from International Financial Institutions (IFIs)	Reports and databases from IFIs
Information provided by IFRC (International Federation of Red Cross and Red Crescent Societies)	IFRC documents and resources
Contributions from international and national NGOs	Reports and publications from NGOs
OCHA Reliefweb reports	OCHA Reliefweb platform
Mapping resources like Map Center in Reliefweb, Map Action, Map Catalogue, AlertNet, UNOSAT, JRC	Relevant mapping platforms and organizations
Disaster history data from EM/DAT (Emergency Events Database)	EM/DAT records and databases

(Source: Adapted from PDNA,2013)

Section 7.4.2. Roles and Responsibilities of Information Management Specialists (IMS)

As PDNA team members, IMS actively participate in the PDNA Planning Mission and Coordination Team, assuming responsibility for conceptualizing, developing, and executing the PDNA information management strategy. Their tasks include designing an IM strategy, identifying infrastructure requirements, coordinating management, forging partnerships, and coordinating with stakeholders. IMS contributes to PDNA Coordination Team meetings, liaising with the media, participating in training workshops, and regularly updating relevant data and reports (PDNA,2013).

Section 7.4.3. Efficient PDNA Data Collection and Analysis

The PDNA Team initiates the data collection phase by gathering and analyzing secondary quantitative data to assess damage across sectors. Field visits, interviews with key stakeholders, and engagement with affected communities ensure comprehensive data collection. Inclusive consultations considering gender, age, and diverse needs guarantee a broad spectrum of perspectives.[8] The collected data undergoes careful analysis, validation, and cross-referencing to facilitate the formulation of sector reports and a harmonized recovery strategy.

Section 8.0. Integrated and Digital Social Protection Information System(s) - IDSPS

Creating a digital and integrated information system is pivotal in constructing a nationwide social protection framework. This system facilitates information flow and effective information management across the social protection sector. It fosters interconnectivity between social protection and other sectors and humanitarian and disaster risk management (DRM). A country's capacity to provide for its population's welfare and respond to its various life-stage needs depends on its capability to identify those in need, enroll them, supply personalized benefits and services, and continually adapt to evolving circumstances. These endeavors demand dynamic and real-time exchange of data and information. Social protection programs contain the acquisition, processing,

[8] For more detail information on sample size: "Determining Sample Size", Balancing Power, Precision and Practicality, Patrick Dattalo, Oxford University Press, 2008.

retention, and utilization of data to inform decision-making and facilitate operational execution. Thus, digitizing these processes offers the potential to minimize errors, streamline procedures, and expedite operations. Moreover, digital transformation enhances the conversion of data into valuable information. Integrating specific functions across the social protection delivery process and interoperability with other national digital systems can achieve economies of scope and scale and foster a comprehensive view of social protection programs' needs. Furthermore, it enhances the coordination and surveillance of program aspects to address these needs across multiple sectors. The IDSPS is anticipated to improve a traditional one in critical points, enhancing accuracy and integrity, efficiency and effectiveness, accountability and people/organization enablement, and inclusion. Regarding accuracy and integrity, the IDSPS can improve precision and trustworthiness by strengthening the management of errors and fraudulent activities with advanced identification, verification, validation, processing, and analysis procedures. This can lead to advanced governance and augmented overall data accuracy and systems integration. In addition, the IDSPS can enhance operational efficiency by alleviating the burdens applicants face through streamlined procedures characterized by fewer documentation demands. This involves facilitating the simultaneous application of multiple programs and granting access to selected services and personal information through online platforms; in addition, amplifying access to data across all implementation tiers, including secure engagement with external stakeholders where applicable, aids in underpinning planning, budgeting, and overall decision-making and management. The IDSPS can achieve accountability and people/organization enablement on different paths. The effective oversight and reporting implemented in such systems streamline oversight across diverse schemes and bolsters reporting mechanisms, encompassing continuous monitoring and evaluation practices. Thus, ensuring a transparent basis for policy decisions, underpinned by clear communication of reasoning, fosters accountability to program beneficiaries, civil society, the government, and funders through information sharing and comparative analysis. Moreover, providing access to third-party resources enriches knowledge of poverty and vulnerability and informs sustained policy discussions. Furthermore, leveraging digital tools to enhance direct people engagement by integrating feedback and appeals into policies and programs promotes frequent changes to improve outcomes. The IDSPS ecosystem also encourages broader digital innovation and entrepreneurship that the government does not solely drive. Additionally, IDSPSs hinge on the informed, comprehensive, and equitable allocation of resources, ensuring fairness and

balance. In this way, the IDSPSs enhance investments to rectify the uneven and disparate provision of social protection across various social groups and administrative domains and promote equity. Moreover, the IDSPSs are designed to implement ‘dynamically adapting’ to an individual’s life-changing events while, based on this feature, they can address significant crises. This feature elevates responsiveness and inclusion compared with traditional social protection systems. This approach also empowers beneficiaries to transition smoothly between schemes as their life conditions evolve. IDSPSs also bolster the formulation and execution of social protection systems. Along with interoperability principles, IDSPSs connect with broader social and economic policies, such as humanitarian aid and disaster risk management (DRM). The qualities of IDSPSs can be tailored by country based on their unique contexts and policy priorities, recognizing that not all benefits may be realized simultaneously.

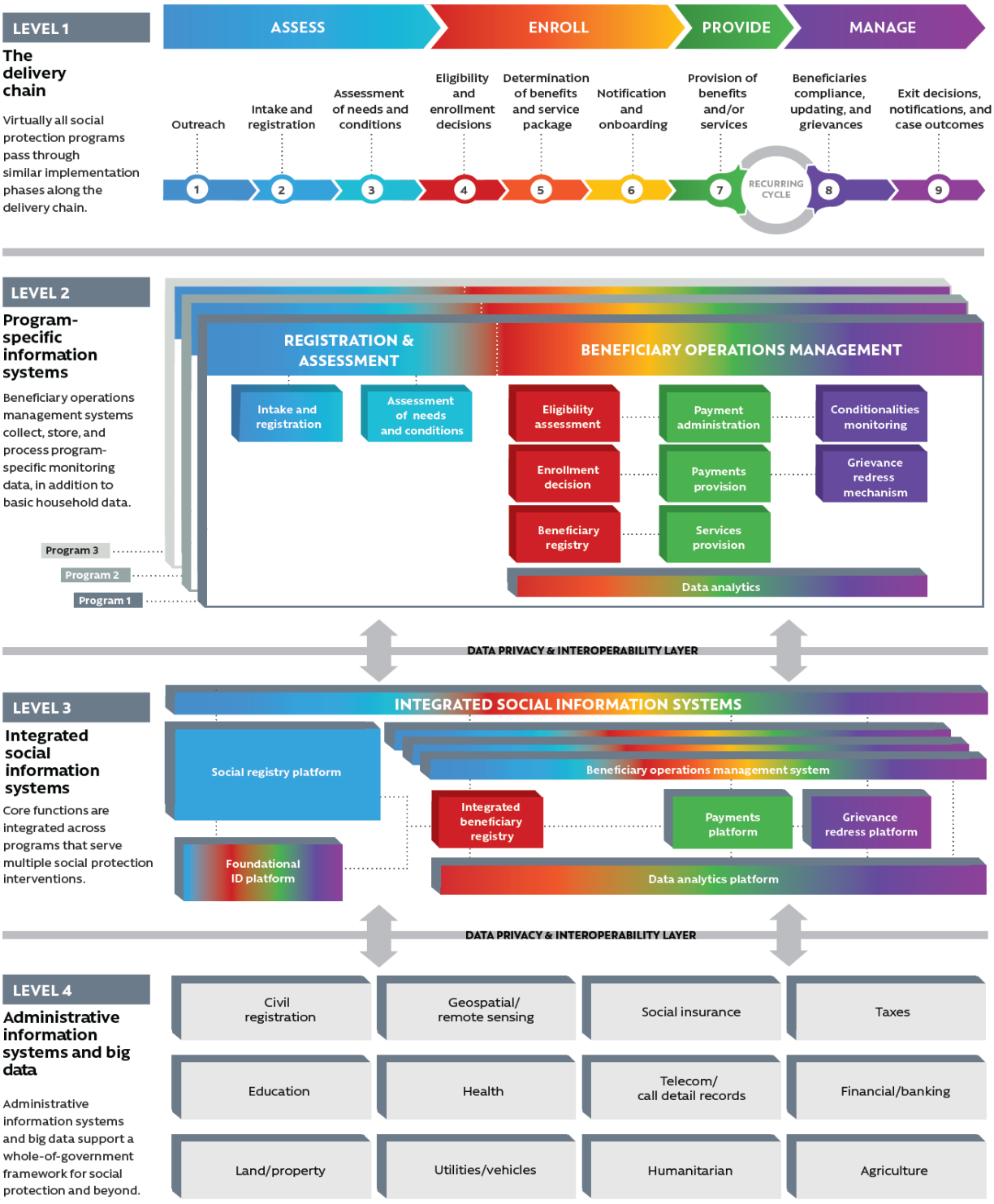


Figure 17. Integrated Social Information Systems to support the delivery of social protection programs: an overview of Core Elements and Links to Whole-of-Government Systems. (Source: Karippacheril, Mittal, World Bank, Caillava, Nishikawa Chávez, Barca, Lindert et al,2020)

Section 8.1. Principal Challenges and Risks of IDSPS

Many countries where IDSPSs are essential due to the basic income of their citizens (middle to low) or due to frequent disaster incidents comprise great rural regions with no or inadequate infrastructure. The absence of essential infrastructure elements can introduce challenges to digitization endeavors. Moreover, if available, telecommunication connections are often unreliable in these countries, hindering the smooth operation of online information systems. Another significant factor to consider is the need for IDSPS to be designed with scalability. The evolution of digital delivery systems is gradual, allowing for the integration of extra elements, such as modules and functionalities. Consequently, the initial design phase should be firmly rooted in a thorough assessment of the present state and the anticipated future requirements. Ownership and responsibility for the operation of such systems are also critical. While delegating development and upkeep responsibilities to the private sector or receiving assistance from partners is common practice, this approach may compromise system ownership and enduring viability. Thus, capacity enhancement efforts through training for the available workforce are becoming essential. IDSPS' data governance encounters issues, such as reluctance to share data and collaborate. Overcoming these obstacles necessitates an all-encompassing, "infrastructural" approach at the government level to resolve these issues in data governance and promote comprehensive cooperation. The design, initial setup, and continuous implementation of IDSPS, including upkeep and ongoing adjustments, are complex and frequently underestimated in terms of investment of time and resources. In addition, the system's accessibility and usability should entail minimal costs for users while yielding tangible advantages. In cases where benefits remain obscured, the potential consequence is that the new IDSPS remains unused, along with all that entails (Barca & Chirchir,2019). Additionally, the digital transformation and integration of information from various sources, as already described, can potentially expose individuals to several risks, such as data loss, hacking, and data misuse; therefore, data privacy and security issues should be extensively evaluated throughout the lifetime of IDSPSs. Moreover, digitalizing data collection, processing, and people-to-system interactions (e.g., filling out digital forms, digital disaster reporting, and digital payment systems) can introduce risks of exclusion compared to traditional social protection programs. This risk can intensify when combined with systems that automate individual and household profiling based on potentially partial or unverified information.

Particularly in scenarios where registration and needs assessment span programs and diverse regions, the danger of systematic exclusion across various social sector schemes emerges. This underscores the urgency of prioritizing data accuracy, fostering inclusive registration systems, and establishing, by design, user-friendly and transparent grievance channels (Barca & Chirchir,2019). Potential peril also involves eliminating human interaction and compassion, both essential elements in offering care and aid to specific welfare recipients, as underscored by Alston (2019). An additional concern revolves around the potential utilization of the IDSPS to enact measures, such as cutting the welfare budget, restricting the range of beneficiaries, discontinuing certain services, imposing stringent and invasive forms of conditions, pursuing objectives of behavioral alteration, and implementing more rigorous sanctions (Alston,2019). Moreover, these policies can promote several actions to gain or maintain program eligibility, such as increased pregnancies due to eligibility for child grants (Peterman, 2021).

Section 8.2. Integrated Digital Social Protection Systems Components

Digital social protection information systems comprise a collection of interconnected components that collaboratively function as a unified system. These components are generally consistent across integrated levels. However, further integration within social protection systems can increase complexity, necessitating more advanced capacity and resources to support this level of integration. According to Barca & Chirchir (2019), the main components of an IDSPS are 1. Information and Communication Technology (ICT) infrastructure; is the essential resources and services necessary to establish, operate, and oversee an IT environment. The ICT infrastructure encompasses the hardware and telecommunications systems chosen, which can differ based on the specific functions carried out and the prevailing country conditions, such as broadband accessibility, mobile phone penetration, and potential utilization of cloud-based solutions. 2. Registry/Database. These terms are generally interchangeable and denote a data repository and mechanism for efficiently organizing, storing, and retrieving substantial volumes of data. Within social protection, the term "Registry" mainly refers to a coupling of databases and software applications that facilitate data conversion into meaningful information. 3. Software; consists of applications designed to oversee, connect (often through application programming interfaces (APIs) or application program interfaces), and handle data. These applications are pivotal in converting raw data into meaningful information, allowing analysis and utilization across various

objectives based on their designated functions. For instance, front-office software applications might offer a user-friendly interface for people and frontline workers, whereas back-office software aids in managing business processes and conducting data analysis (Barca & Chirchir,2019). 4. Human Resources. Barca & Chirchir (2019) use the term "brainwave," which mechanizes human involvement and should be avoided. Human resources are crucial for successfully implementing digital social protection information systems. Human resources should possess a diverse range of competencies, including expertise in both IT and sector-specific knowledge. Key areas of expertise include IT and Data analytics skills (Information Systems managers, network administrators, database designers and administrators, software developers, cybersecurity specialists, data engineers, data scientists, Economists, etc.), program management, and business process engineering skills, such as professionals who comprehend the operational aspects of existing social protection programs and can address user needs through digitization and integration, promotion, and capacity building skills, such as professionals capable of facilitating collaboration and data sharing among multiple stakeholders and promoting system understanding and acceptance through training, workshops, newsletters, and other communication channels. 5. The institutional setting, including the framework supporting the IDSPS, is vital to its success. This framework comprises several key frameworks, such as the Policy and Legal Framework, which provides clear policy and legal support for the social protection sector, information systems, and broader e-governance efforts. This involves defining the roles, responsibilities, and functions at different levels. The Institutional and Governance Framework establishes a robust governance structure with top-level government ownership and well-defined coordination mechanisms. This can involve steering committees, memoranda of understanding (MoU), and other arrangements to ensure effective collaboration. Moreover, a framework that allocates a multiyear budget and covers various costs associated with system development, data collection, maintenance, hardware, software, training, audits, etc. Additionally, a framework for procedures, standards, and principles involves implementing procedures, standards, and principles that govern data collection and usage[9]. These should align with recognized international data protection standards and digital development principles. Ensuring the incorporation of these components within the institutional framework is essential for efficiently operating the social protection information system.

[9] For detailed information on Principles for digital development see: https://digitalprinciples.org/

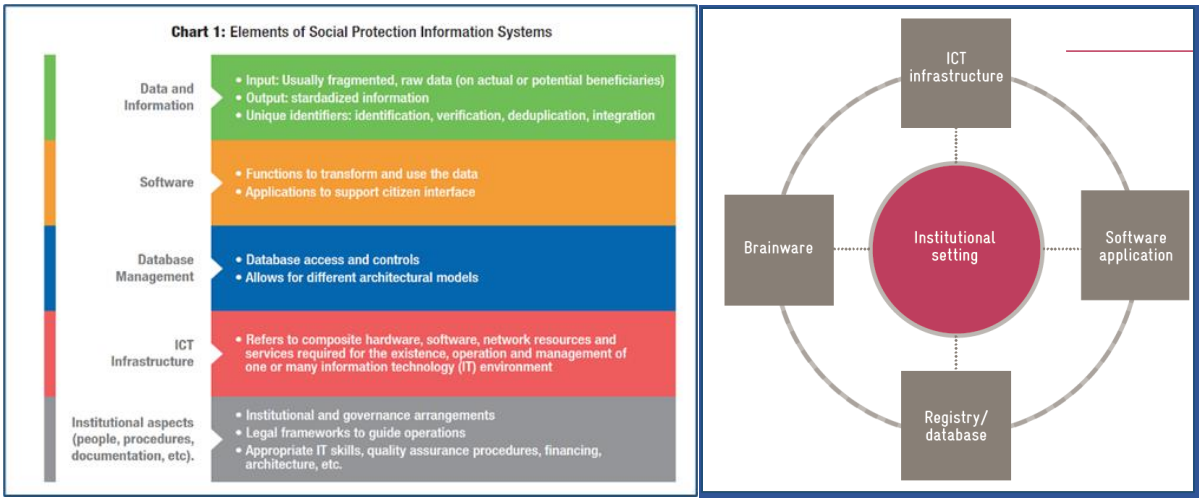
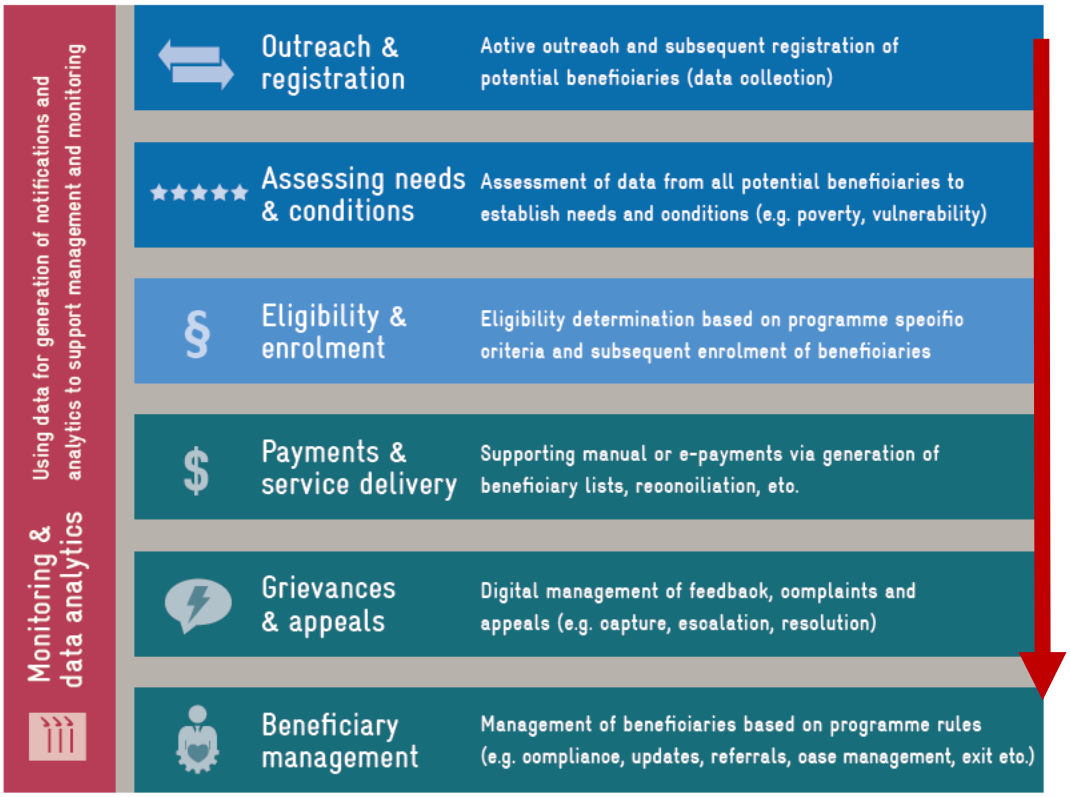


Figure 18. Comparison of the main components of an Integrated Digital Social Protection System (IDSPS) based on Leite et al. (2017) (left) and Barca and Chirchir (2019) (right)

Figure 18 illustrates the components of Social Protection Information Systems outlined by Leite et al. (2017) and Barca & Chirchir (2019). While most components remain consistent across both approaches, such as ICT infrastructure, software, databases, and institutional elements, there are variations in specific components or functions, with some being classified differently or assigned to other components. For instance, according to Leite et al. (2017), individuals are considered part of institutional aspects. In contrast, Barca & Chirchir (2019) are categorized under "Brainware," specifically as Human Resources, which forms a distinct component. Barca & Chirchir (2019) introduced the fundamental architecture of the IDSPS, placing the institutional setting at its core. This architecture facilitates interactions among all components, with the institutional setting assuming a controlling role in the system's processes. However, there is a shortage of established principles and protocols governing the presentation of a basic IDSPS architecture. This absence hinders the establishment of a consistent framework for the IDSPS, regardless of the alternate versions that individual countries might adopt during their implementation. The progression through the implementation phases along the Social Protection delivery chain is presented in Table 13. Commencing with outreach and registration, subsequent steps involve evaluating the conditions and establishing enrollment eligibility. Subsequently, cash transfers are allocated for service delivery, where applicable. Feedback on the delivery chain is received, and beneficiary management is adjusted accordingly. Monitoring and data analytics are implemented throughout these stages and are pivotal in decision-making in each phase.

Table 13. Stages of Implementation across the Social Protection Delivery Process



(Source: "Building an integrated and digital social protection information system; Barca and Chirchir, 2019, adapted)

Barca & Chirchir (2019) applied an extra categorization to the implementation phases of social-protection information systems (SPIS). They introduced three main pillars (Figure 19) and classified each phase into one pillar. The first pillar is individual social protection programs' specific operations and functions. Every social protection program in each country encompasses comparable stages of its implementation process along the delivery chain. The program's Beneficiary Operations Management System (BOMS), according to World Bank terminology, along with its linked database, can facilitate the execution of these phases, depending on whether the dedicated software is intended to do so (e.g., in certain countries, specific phases may not be adopted or may not be supported), often through specialized modules. Custom BOMSs may have been developed to support analogous functionalities across various countries with diverse programs that serve distinct needs and demographic segments. The second pillar facilitates integrated operations and functions across the social protection sector, promoting coordination and collaboration. Integrated operations and functionalities can potentially streamline critical social protection delivery chain processes. These processes can be integrated into digital platforms that

provide multiple or all social protection interventions within a country, along with programs from other sectors. This integration overcomes fragmentation and inefficiencies while enhancing service delivery to citizens. A principal entity of integrated functions is social registries, crucial in consolidating outreach, registration, and comprehensive assessments for multiple programs. These registries compile individual and household data and offer insights into the socioeconomic circumstances of potential beneficiaries. Beyond their immediate functions, social registries have the potential to evaluate the demand for social programs by providing a nuanced understanding of the distinct needs and conditions within different segments of the population. An integrated beneficiary registry can be seen as an expansion of social registries and a centralized repository combining data analytics across multiple programs. By offering a comprehensive view of the benefits received by beneficiaries, the registry aids in coordinating efforts, planning initiatives, and implementing integrated monitoring strategies. One notable application is identifying overlapping and gaps in various programs, facilitating efficient resource allocation, and streamlining operations across the delivery chain. Next, the payment platform offers an integrated solution for managing payments across multiple programs with the potential to facilitate transactions through various channels, such as numerous banks and other financial service providers.

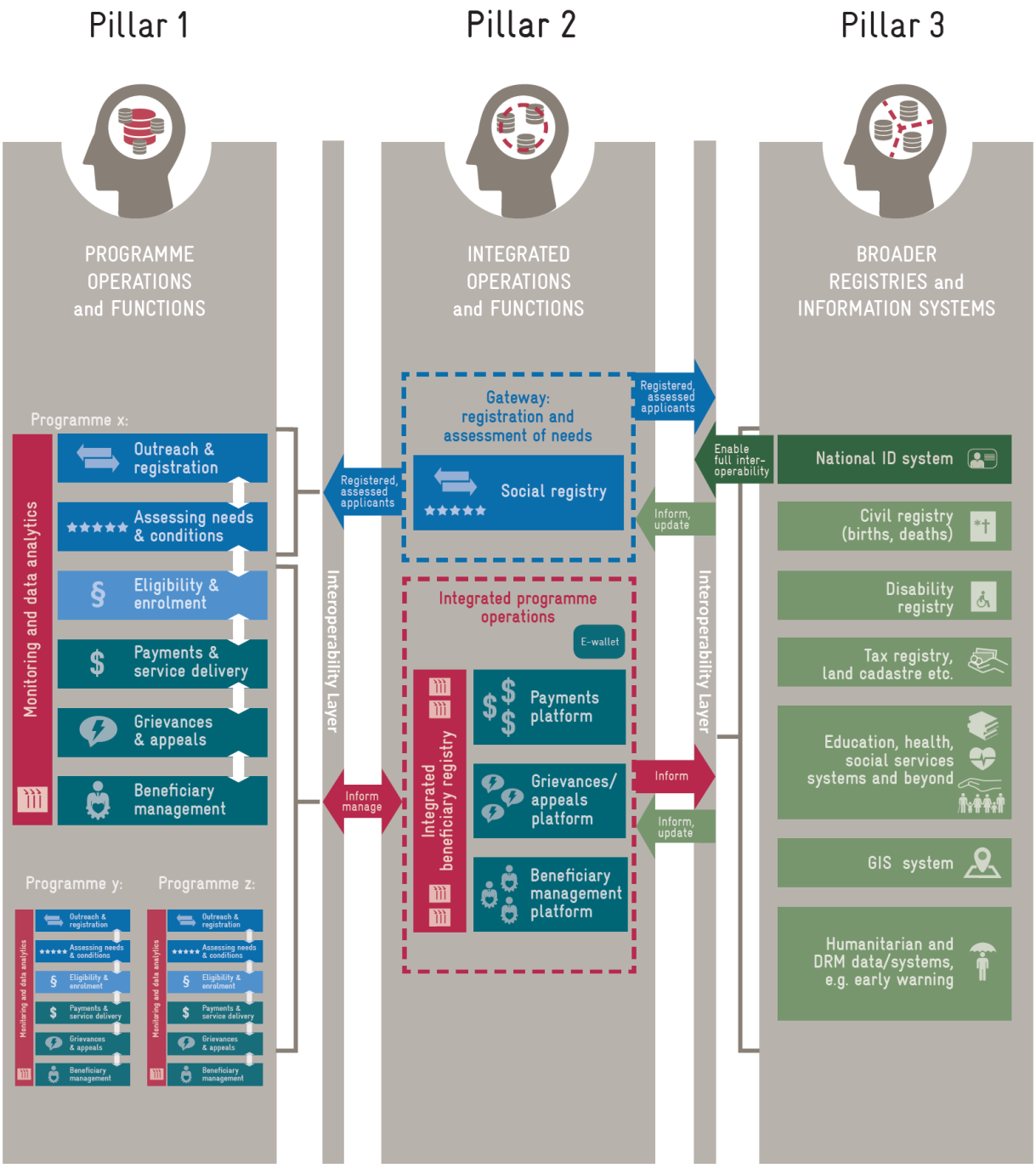


Figure 19. The three pillars of Social Protection Information Systems along with the information flow (Source: Barca & Chirchir,2019)

These platforms may leverage existing government-to-person (G2P) payment systems implemented by other sectors, enhancing the efficiency and accessibility of payment processes for social protection programs. Subsequently, a grievance and appeal platform (see section 8.3.) serves as a digital channel for collecting, handling, and resolving public feedback, complaints, and appeals, spanning multiple programs. This platform is accessible to all individuals and can be used for various social protection interventions. It could be built upon comprehensive government-wide grievance systems in certain instances, fostering a streamlined approach to address concerns and improve accountability. The final part of this pillar is the beneficiary management platform, which offers a range of functionalities spanning various programs and sectors. Tailored to a country's specific requirements, it can cover ongoing tasks, such as updating beneficiary details, confirming compliance in conditional cash transfers (CCTs) and labor programs, managing referrals between programs, overseeing intricate cases, and facilitating exits according to predetermined criteria. This platform streamlines management tasks and ensures efficient support. The third pillar of Barca & Chirchir (2019) analysis encompasses a broader range of registries and information systems that can significantly enhance sectoral outcomes. These systems may be managed by social protection stakeholders or externally, depending on the country. Integrating broader registries and associated information systems within this ecosystem is important for achieving desired outcomes, such as accuracy, inclusion, and efficiency. These interconnected systems facilitate a two-way exchange of information and contribute to positive results. Although some of these systems may be under the direct control of the social protection sector, they are frequently managed externally by various stakeholders and sectors. External management introduces coordination complexities and potential data governance and politics issues. The national ID system is the most commonly used registry worldwide, a pivotal tool for identifying and authenticating individuals. It offers the potential for various benefits, such as enhancing the interoperability between registries through a distinct and unique identifier. Additionally, this system can reduce errors and fraud within different data systems. A civil registry also serves as a valuable resource for pre-populating, verifying, validating, and updating information related to significant life events, such as birth, death, and marriage. This function enhances data accuracy and reliability within a broader information system. Moreover, disability registries are crucial in facilitating coordination and support for disabled individuals. Many countries have dedicated institutions responsible for registering and assessing people with disabilities. Data from this

registry can be effectively integrated into social protection programs, creating a two-way link that enhances the provision of targeted assistance to persons with disabilities and mainstreams their support within broader social protection initiatives. Additionally, collaboration between social protection systems and other sectors such as education, health, and social services is crucial to address the multifaceted needs of individuals and households comprehensively. Integrating data exchange with these sectors enhances coordination, planning, and monitoring. This integration also yields practical advantages, such as tracking co-responsibilities, automatically populating relevant information, assessing needs and conditions, and connecting with other sectoral programs (e.g., social health insurance). Integrating income/tax and land cadastre registries also holds significant value, particularly in means-tested programs. Social protection data can be enriched by linking data from tax registries, land cadastres, and other relevant agencies. This integration assists in verifying self-reported information, thereby aiding the accurate assessment of needs and conditions for potential beneficiaries. This linkage also contributes to error and fraud prevention in social protection initiatives. Furthermore, humanitarian and disaster risk management (DRM) data and systems, such as early warning systems, have significant potential for integration into the social protection sector. These sectors often gather and manage valuable information that is mutually beneficial (Barca & Chirchir, 2019). For instance, data from early warning systems can serve as triggers for prompt responses to shocks in the social protection sector. Likewise, historical data from humanitarian responses, including vulnerability assessments and beneficiary databases, can be integrated into the existing social protection registries. As all events occur in some place, Geographic Information Systems (GIS) are essential tools for managing geospatial data related to infrastructure, households, and assets. Integration with data from the social protection sector offers valuable insights and capabilities. By combining these datasets, GIS can facilitate location-based monitoring, coordination, planning, and operations customized to the requirements of specific regions. The interconnectedness of the various components discussed above is crucial, and the flow of information between these components plays a pivotal role. Achieving seamless information flow requires full interoperability, which entails systems that share information using common standards and unique identifiers. Although this challenge goes beyond technical aspects, necessitating legal alignment, organizational process synchronization, and shared definitions, network theory and communication protocols can be implemented to establish common and widely accepted practices. Ad-hoc methods for data exchange are also prevalent, ranging from basic file

sharing to the algorithmic matching of individuals. Regardless of the approach, certain principles, such as prioritizing user information needs, detailed planning and formulation, and data collection, should guide the process. Minimal data collection while ensuring data privacy protection eliminates redundancy. Horizontal communication within and beyond the sector and vertical communication across administrative levels is vital. Social protection data can inform planning in other sectors, while data from other sectors can validate and enhance the collected information. Developing standardized data norms and common requirements over time forms the foundation that fosters collaboration and consistency. The diversity of choices across countries in designing and implementing social protection information systems can significantly impact system performance. Therefore, before any design or implementation, key questions should be addressed to evaluate the system's potential against each country's objectives. For instance, if information system coverage spans the entire population, it shapes beneficiary selection and program effectiveness. Additionally, systematic exclusions can occur based on data collection methods, validation, and qualifying conditions, necessitating strategies to address these issues. Moreover, various strategies, such as census surveys or on-demand methods, impact data accuracy and future updates. Additionally, digital interfaces and data exchange points influence data upkeep. Furthermore, data quality and trust significantly impact system success, warranting robust verification, validation, and storage. Closely related to it are the variable types collected and stored, which differ depending on user programs and needs. A pivotal point is the limited capacity of data analytics (infrastructure and human resources) in many countries, which hinders gaining knowledge and enhancing program design and implementation. Different design choices in Social Protection Information Systems cater to specific user requirements. Choices range from digitizing at the program level using BOMS, integrating gateway functions via social registries, beneficiary registry integration, and even cross-sectoral integration for a people-centric approach; therefore, these design considerations impact how effectively the system caters to users' needs and broader goals. In addition, interoperability, data sharing, privacy, and security are critical considerations in social-protection information systems. The flow of data and operationalization of these factors depend on the unique identifier used, data-sharing architecture, data-standardization approaches, and political and institutional elements. Data privacy and security assurance relies on privacy based on design principles and legal frameworks. International documents such as the Universal Declaration of Human Rights, the ICCPR, and ILO's Social Protection Floors Recommendation

2012 (No. 202) emphasize the need to secure and protect private individual information in social protection systems; however, implementation of these frameworks is not guaranteed in many countries. These points underline countries' different choices in configuring their social protection information systems, directly influencing their effectiveness and alignment with their goals. Moreover, it highlights that building an integrated social-protection information system involves technical and political dimensions. What truly matters is the consistent achievement of the system's objectives when utilized. Additionally, it is crucial to establish metrics that can gauge the enhancement of parameters associated with a system's historical usage (e.g., the quantification of complaints or appeals received) (Barca & Chirchir, 2019).

Section 8.3. Information Systems for Grievances Redress Mechanism

The Grievance Redress Mechanism (GRM) is a comprehensive framework comprising institutional structures, mandated rules, procedures, and processes designed to address and resolve complaints, appeals, and queries related to social protection programs (Figure 20). The information system supporting a GRM can range from a basic logbook to a sophisticated dedicated information management system (Lindert et al., 2020). Incorporating a GRM module within the social protection program's information system or adopting an independent system that integrates with the program's information structure is essential for the overall information system.

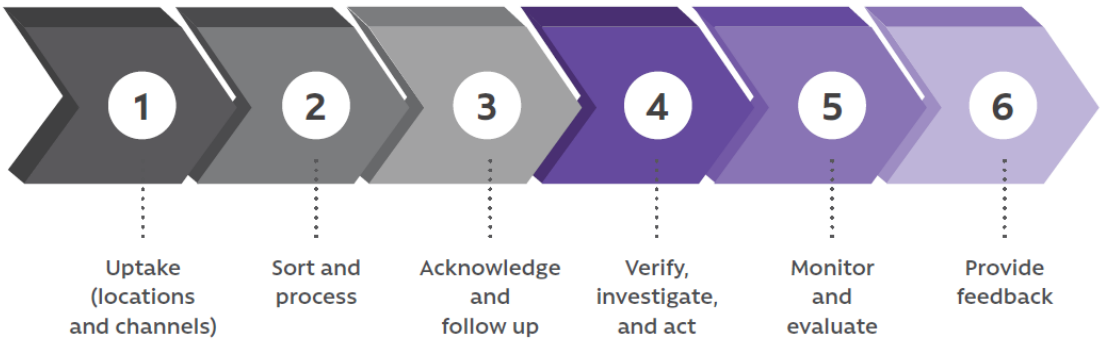


Figure 20. Steps of the implementation of GRM systems (Source: Linder et al.,2020; World Bank,2018)

Although GRMs can potentially involve independent institutions, in-house development is preferred. Lindert et al. (2020) identify three primary types of in-house GRMs: a single program

(or project) GRM dedicated to a specific social protection program, a multiprogram (or ministry-level) GRM covering multiple programs within a ministry or sector, and an in-country (or national) GRM catering to grievances across government programs. These systems can coexist as distinct channels for grievance resolution. Effective grievance resolution hinges on clearly defined processes, roles, and responsibilities within program administration. Standard features of effective GRM systems are presented in Table 14. Traditional GRM methods pose challenges, including cost, institutional capacity, labor-intensive processes, and resource constraints. Consequently, innovative GRM channels have emerged leveraging new technologies, such as mobile phone solutions that leverage mobile phones for interactive GRM, utilizing automated toll-free, SMS-based mechanisms. This approach is particularly beneficial in areas with low smartphone diffusion and 3G coverage, providing an inclusive, automated, cost-effective solution. Also, social media communication channels, which harness social media platforms and private messaging apps, can establish direct two-way communication for issue resolution. These channels facilitate interactive feedback from beneficiaries and the broader population. Moreover, due to the wider adoption of these technologies, chatbots and virtual assistants that integrate Natural Language Processing (NLP) and Artificial Intelligence (AI) to create advanced GRM tools capable of addressing recurring queries are emerging (Lindert et al.,2020). These channels offer improved inclusiveness, cost-effectiveness, and efficiency compared to traditional methods, showcasing the transformative potential of technology in optimizing GRM processes within social protection programs and, based on these features, could be adopted for Adaptive Social Protection.

Table 14. Features of effective GRM information systems

Key Feature	Description
Real-time data collection	Grievance data are collected in real time from various uptake channels, including website, SMS text, and social media
Automated response	Where applicable, automated response is issued to acknowledge the receipt of a grievance, generate a case number, and inform a stipulated resolution time and follow-up methods
Consolidated data repository	Collected data are stored, including data through informal grievance channels
Dashboard: Internal interface	• Allows real-time tracking and monitoring of resolution status per case and allows viewing assigned officer information • Allows the monitors of the GRM to see flags when resolution time frame is nearer, and issues automated reminders to an assigned officer and his/her supervisor(s) • Decision makers have access to real-time evidence for evidence-based policy and program decision making with data visualization and/or geotagging features
Dashboard: External interface	• Allows real-time tracking of resolution status with a case number • Allows the public to view the aggregated grievance resolution status of the program, along with the regular reports (e.g., annual reports)
Rapid custom reporting	• Automated reporting feature allows decision makers and other stakeholders to have program/project information as frequently as they want • Various reporting types—pie and bar charts, maps, and so on—can be chosen • Customization allows selecting which data are to be analyzed at which level and how frequently
Language	Multiple languages can be used or different language options can be chosen
Security	Data encryptions, firewalls, and the like safeguard the grievance and personal data collected
API	Maximizes compatibility with other applications

(Source: Kumagai et al.,2013; Lindert et al.,2020)

Section 8.4. Digital Payment Transfers in Social Protection and Adaptive Social Protection Programs

The humanitarian sector and government-led social assistance programs are increasingly adopting digitalization in their cash transfer operations. This has created an expectation of aligning humanitarian cash and voucher assistance (CVA) with social protection (SP) programs. As a result, intentional adoption of digital payment methods has become necessary. The framework and principles surrounding digital payments set the backdrop for discussion among various stakeholders, including governments, humanitarian practitioners, and the private sector. Principles emphasize user-centricity, inclusivity, data privacy, security, reliability, and preparedness and

guide designing, assessing, and scaling digital payments (Akbari et al.,2023). Existing toolkits[10] and guides from organizations such as the CALP, World Bank, and the UNCDF contribute to building contextual perspectives. Recognizing the distinct operational approaches of governments and humanitarian actors to cash transfers is crucial. Differences in program design, participant identification, service provider contracts, and data management highlight opportunities for collaboration, mutual accountability, and areas that may require additional support.

Table 15. Principles on digital payments: Authorities that summoned the initiative and targeted sector

Digital Principles	Authority	Targeted Sector
Barcelona Principles on Digital Payments (2016)	USAID	Humanitarian aid
Principles on Public-Private Cooperation in Humanitarian Payments (2016)	World Economic Forum	Humanitarian aid Private sector
Join Donor Statement on Humanitarian Cash Transfers (2019)	Donor Cash Forum (DCF)	Humanitarian aid
UN Principles on Responsible Payments (2021)	UNCDF – Better Than Cash Alliance	Humanitarian aid Development Governments Private sector
Join Donor Statement and Guiding Principles on Interoperability of Data Systems in Humanitarian Cash Programming (2022)	Donor Cash Forum (DCF)	Humanitarian aid

(Source: Akbari R., Swift-Reeves A., Goodman R., and Barca V., 2023, adapted)

Key terms and concepts related to digital payments are essential for informed decision-making regarding social protection cash transfers. These include differentiating between peer-to-peer (P2P) transfers or (person-to-person) and government-to-person (G2P) transfers, understanding intermediary service providers and payment systems, and determining the degree of digitization in payment cycles.

[10] Indicatively: Interagency Social Protection Assessments (ISPA), Digital Ecosystem Country Assessment (USAID), Digital Payment Toolkit (nethope.org)

Evaluating the relevance of digital payment adoption involves assessing five building blocks: infrastructure, regulatory and policy frameworks, financial ecosystem, program cycle, and user experience. Infrastructure encompasses digital identity, payment gateways, and network connectivity, whereas regulatory frameworks ensure a conducive legal environment. Data protection policies, Know Your Client (KYC) regulations, and mechanisms for preventing fraud and corruption contribute to a robust regulatory framework. Accountability measures, especially in the financial ecosystem and consideration of user experience, round out the evaluation criteria (Akbari et al.,2023).

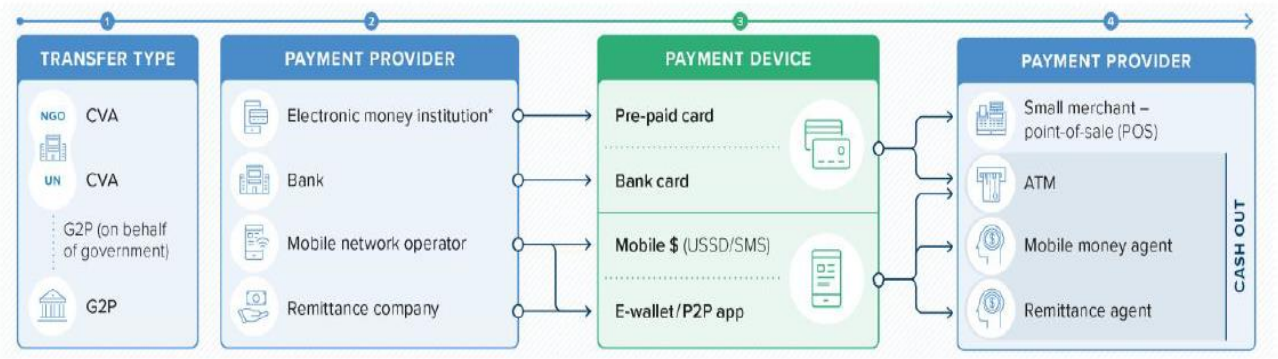


Figure 21. Payment Transfer scheme using different channels (arrows show possible scenarios, from left to right) (Source: Akbari R., Swift-Reeves A., Goodman R. and Barca V. (2023). Digital cash transfers and transitioning from humanitarian cash to Social Protection, STAAR, Guidance note.[11]

As the adoption of digital payments lies at the intersection of humanitarian cash, voucher assistance, and social protection, it is essential to understand distinct operational approaches, incorporate prevailing frameworks and principles, and evaluate critical factors to ensure a successful and inclusive transition to digital payments (Megersa,2020). Governance and coordination are pivotal in successfully adopting digital payments within humanitarian cash transfers and social protection programs. This involves convening stakeholders through steering committees or cross-functional coordination structures and engaging various government institutions, private sector actors, and downstream partners. Existing models demonstrate effective

[11] Electronic Money Institutions (EMIs) are digitally enabled financial service providers authorized to disburse electronic money (e-money). The term e-money includes any form of monetary value stored electronically (e.g. on a card or in an e-wallet).

multi-stakeholder digitalization efforts[12]. Electronic Money Institutions (EMIs) and fintech companies also participate in the digital transfer process. While these organizations differ from banks in regulations and operations, sharing similarities with payment service providers (PSPs), they are becoming alternatives to banks given their lower capital requirements and advanced flexibility. Payment triggers for anticipatory action or shock response in social protection systems require commitment from diverse government institutions and data sources to establish contextual thresholds, data-sharing processes, and decision-making points. Additionally, e-governance strategies lay the groundwork for technical bodies to institutionalize digitalization commitments (DGS,2019). The local market must accept digital payments for digital transfers to remain widespread. This necessitates equipping merchants with essential payment devices and network subscriptions and building trust in accepting digital payments. The cost-effective setup of digital payment systems for small businesses, accessible products/services, and merchant acceptability facilitated by effective onboarding campaigns contribute to the success of digital payments (Akbari et al.,2023). Despite a robust digital payment ecosystem, participants' trust in and access to products and services are crucial for maintaining complete digital transfers. Digital and financial literacy programs, especially across marginalized communities, help build familiarity with digital devices, payments, and money storage. Trust-building measures, such as user-centric product development through public-private partnerships, contribute to an increased demand for digital payments. Widescale digitalization efforts require medium-to-long-term horizons and are compatible with immediate humanitarian needs. Prerequisites for successful digital payment adoption include quality cash programming at scale, financial and digital literacy, stakeholder willingness to engage over the long term, and essential infrastructure such as mobile network coverage (Akbari et al., 2023). Understanding contextual readiness involves monitoring the indicators related to infrastructure, regulations, and market dynamics. The benefits of digital payments include increased efficiency, security, transparency, and linkages with social protection programs (O'Brien et al.,2013). However, potential risks such as exclusion, gender disparities, loss of trust, and data privacy concerns require careful consideration. The lack of interoperability and the risk of neglecting future opportunities for humanitarian-development nexus objectives should also be addressed through stakeholder engagement and codified commitments. Transitioning to digital payments does not eliminate fraud risk, and strong teams, good practices, and clear policies

[12] This is the case in India (https://www.indiastack.org/) and Estonia (https://e-estonia.com/)

are critical success factors. Political economies, incentive structures, and redlines should be considered to ensure that investments align with broader goals, such as linking humanitarian cash with social protection systems (O'Brien et al.,2013). Additionally, the shifting to entirely digital payments should be done gradually for lasting results. A good practice is to focus on ecosystems over products and adopt open-source development principles. Moreover, modularity is best practice, all-in-one digital products should be avoided, and reliable service providers should be selected. Also, Akbari et al. (2023) express their concern about the ownership and control of funds post-transfer because it may impact the ability to recover funds.

Blockchain technology plays a relevant role in the digital payment framework. Blockchain technology often involves cryptocurrencies. Therefore, considering the political (Figure 22), regulatory, and privacy implications is critical when adopting blockchain or cryptocurrencies.

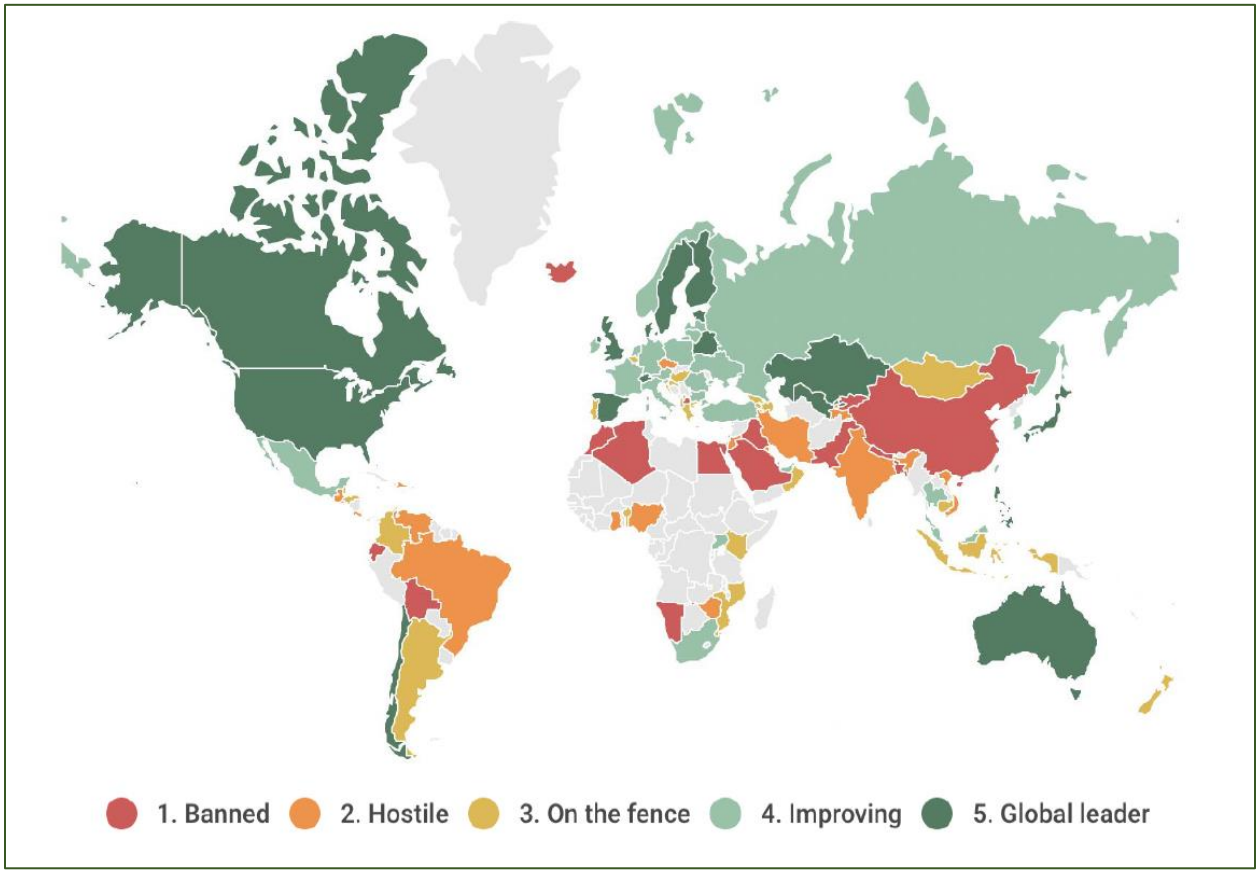


Figure 22. Countries with restricted or banned cryptocurrency policies (Source: Akbari R., Swift-Reeves A., Goodman R. and Barca V., 2023). Digital cash transfers and transitioning from humanitarian cash to Social Protection, STAAR, Guidance note.

Thorough assessments of the feasibility of implementation should be done to identify problems, gauge local market behavior, and understand recipient preferences. Figure 23 presents a blockchain implementation in Australia for the National Disability Insurance Agency (NDIA), where an information system was developed using tokens to represent promises to pay in AUD and smart contracts for spending conditions based on specific rules (Royal et al.,2018). A few examples[13] of scaled blockchain applications exist in humanitarian responses (Cheesman,2022; Akbari,2023), with pilots focusing mainly on data management. However, several UN initiatives are investigating the potential of blockchain technology (Starkie,2017). The risks and ethical concerns related to blockchain experimentation should be carefully considered. Concerns have been raised regarding using blockchain and new, untested web3 technologies in marginalized communities and poor countries (Jutel,2021; Cheesman,2022). Jutel (2021) states that "a minimal requirement for an ethically sound blockchain humanitarian project would involve acknowledging the risk and ideological extremism of crypto, the importance of developing world sovereignty, and the legacies of colonialism through technological abstraction."

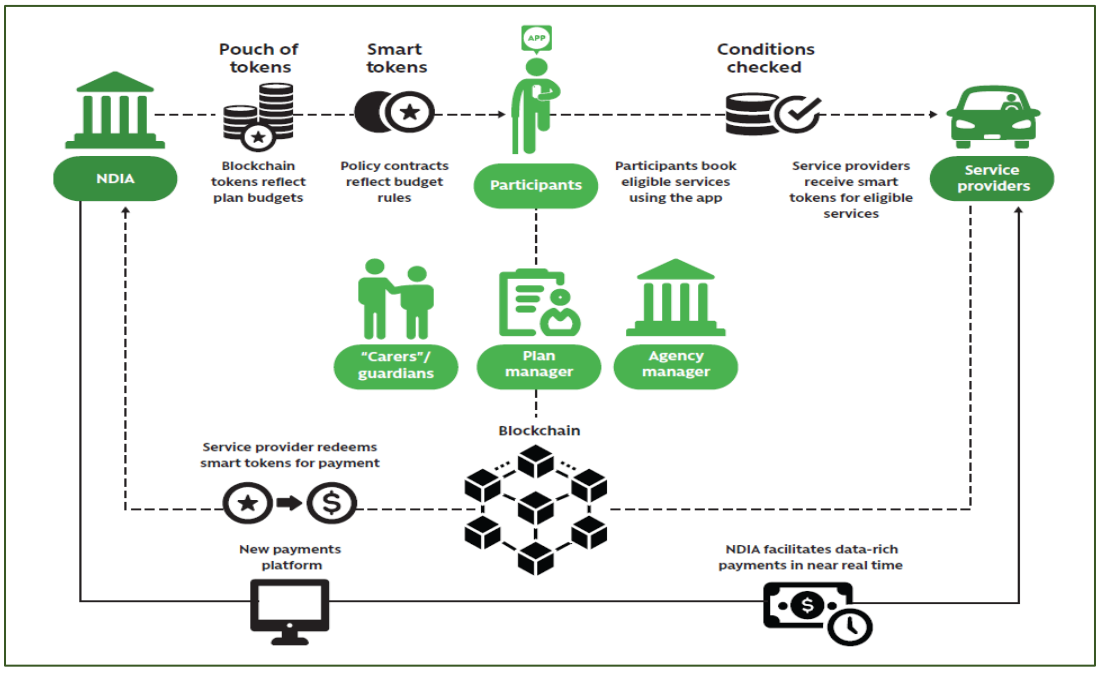


Figure 23. Smart contracts and blockchain tokens for service provider payments (Source: Lindert et al,.2020; Royal et al.,2018)

[13] Examples include UN World Food Program's Building Blocks Project in Jordan (2017), Unicef's Leaf Wallet (2019) and Oxfam's Unblocked cash project in Vanuatu (2019)

Monitoring government initiatives, developments in Central Bank Digital Currencies (CBDC), local contexts, market dynamics, and individual preferences are critical parameters for adopting alternative digital payment methods.

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