Information Sciences Letters

Volume 11
Issue 5 *Sep. 2022*

Article 32

2022

Water Accountability Model under Emergency Cases and for Areas Gained New Access to Water Services

Zeyad Alshboul
Department of Civil Engineering, Faculty of Engineering, 26810 Ajloun, Ajloun National University, Jordan, z.alshboul@gmail.com

Follow this and additional works at: https://digitalcommons.aaru.edu.jo/isl

Recommended Citation

Alshboul, Zeyad (2022) "Water Accountability Model under Emergency Cases and for Areas Gained New Access to Water Services," *Information Sciences Letters*: Vol. 11 : Iss. 5 , PP -.
Available at: https://digitalcommons.aaru.edu.jo/isl/vol11/iss5/32

This Article is brought to you for free and open access by Arab Journals Platform. It has been accepted for inclusion in Information Sciences Letters by an authorized editor. The journal is hosted on Digital Commons, an Elsevier platform. For more information, please contact rakan@aaru.edu.jo, marah@aaru.edu.jo, u.murad@aaru.edu.jo.

Information Sciences Letters
An International Journal

http://dx.doi.org/10.18576/isl/110532

Water Accountability Model under Emergency Cases and for Areas Gained New Access to Water Services

Zeyad Alshboul *

Department of Civil Engineering, Faculty of Engineering, 26810 Ajloun, Ajloun National University, Jordan

Received: 21 Feb. 2022, Revised: 22 Mar. 2022, Accepted: 12 Jun. 2022.
Published online: 1 Sep. 2022.

Abstract: We present a reference accountability model for water utilities that consists of five major components, namely organization, systems, data, communication, and quality management. The model has been discussed with water officials, experts, and stakeholders in order to build and customize the model for each utility through a pre-prepared questionnaire and focused groups. Results have shown that water utilities have different accountability systems with several drawbacks. There was a need for actions taken to secure regular customers' data updates as well as activate e-services in order to access vital information during emergencies. It was therefore our strong recommendation to the water utilities to move forward with some measures to support and sustain their bi-directional communication with customers. Further recommendations encouraging water utilities to enhance the accountability mechanism such as the deployment of e-services complaints management and tracking, expanding the Enterprise Resources Planning system, improving staff communication skills, training staff on the procedures used in analyzing customers' feedback, and moving to performance-based management system.

Keywords: Accountability, IoT, Water Management, Water Governance, Water E-services.

1 Introduction

Water resources are limited and many parts of the world encounter water scarcity, loss and deterioration in water quality [1,2,3,4]. Water crises in many parts of the world are not associated with physical availability rather are related to power, poverty and inequality [5,6,7]. Management of water resources and improvement of associated services will provide the best long-term prospects, especially during the changes in economics and technological aspects around water [5]. Moreover, management of water resources and services is important during emergency cases and disasters in order to mitigate the impact of critical situations and gain the ability to encounter external challenges and disturbance and thus recover very quickly [8, 9]. Management approaches of water resources and services have been shifted recently for obtaining sustainable development and resilience[10]. These approaches have been linked with technology driven tools for good governance and high quality services [11, 12]. Sustainable water services have shown to governance dependent processes, and lack of accountability during processes could lead to deterioration of service delivery and assessment [13].

Accountability has been defined as approaches, mechanisms, tools and actions used to ensure the desired level of services are delivered to stockholders [14, 15]. In fact, it is considered as the most powerful tool of good governance. In water context, the corresponding action and mechanisms of accountability will maintain continuous improvements to the water services by holding accountable those working in delivering water services for actions response to those they serve [16,17,18]. Activating accountability will boost the participation of citizen in water management, service providing, monitoring and feedback systems. Stakeholders can also participate in supervising and monitoring performance of water service providers by involving budgeting, reporting or audits [19]. This transversal accountability is a key to improving the flow of services by continuous evaluation of each water service and related assessment. However, assessing and improving accountability tools and mechanisms will organize both vertical and transversal accountability by providing a well-established model for each civil contribution. In arid and semi-arid regions where sustainable water and sanitation services are poor, water service delivery need to be improved to ensure sustainability of services [14]. However, lack of accountability during water service delivery may obstruct the improvement of processes involved during water supply and thus impact the efficiency of water utilities. This is the case in urban areas where non-revenue water is high, which has a visible impact on service delivery [13, 14]. The quality and efficiency of service delivery are expected to be poor during emergencies, especially in refugee camps where many new people require to have an access to water public networks. This will cause a delay in service realization and therefore required fast tool for updating customers' information [12].

Citizen-engagement initiatives do not always impact accountability and may have a minor impact on the

*Corresponding author e-mail: z.alshboul@gmail.com

© 2022 NSP
Natural Sciences Publishing Cor.

immediate service delivery. Many studies indicated that these initiatives have negative outcomes due to the failure to response to demands or violence against participation [20, 21]. Furthermore, participation of society on improving services has shown to be successful for immediate goals like issues related to the delivery process, but these participations are not feasible for long-term goals of reaching high service quality or empowering the citizen. However, each context within the accountability may be improved through a right strategy and thus achieving high quality of services [22, 23]. For instance, access to complaints mechanisms is low in many countries, especially in rural areas as well as answerability and customer satisfaction [14, 24, 25]. Structuring suitable ways to strengthen the accountability links in the water sector are key for improving governance of water and thus services[26].

Many studies have addressed and assessed water accountability in different countries and discussed the impact of social participation in service quality. But based on the authors' knowledge, there was no detailed study presenting mechanisms and ways that link different actors involved in water services in normal and emergency cases. Furthermore, there has not been sufficient studies related to the use of the internet of things (IoT) and e-services and tools in accountability systems. Communication between water utilities and customers is a key during normal service delivery and emergency situations. Moreover, understanding customers' expectations through gathering and analyzing their feedback is a key driver towards continuous improvement of services and performance of the water utilities. This study aims at reviewing and assessing all existing accountability systems between water users and governance bodies in Jordan in order to improve these systems and increase its suitability in emergency situations. This study structures a new model of accountability in order to improve services provided to customers in the water sector. Specifically, we present an integrated accountability mechanisms and e-services that can be used for future development programs. Throughout of the study, we assessed the existing accountability systems in the water utilities in Jordan in order to evaluate the existing mechanisms in emergency cases and for areas newly accessed to water services, e.g. Refugee camps. Our results were based on focused groups of selected people and NGOs, meetings with experts, different consultation sessions, literature reviews, and questionnaire. The discussion addressed which of the mechanisms are needed tools, equipment, applications and technology in order to direct water utilities to improve their strategies to deal with new input data. The study concludes further developments and creation of this framework and suggested an information management mechanism for future smart water e-services.

2 Research Significance

Responses to the community's needs during emergencies are subject to the delay and incomplete processes and inefficient selection and delivery mechanisms. Most of needs assessment mechanisms are performed manually through voluntary processes, which mostly more expensive and time consuming. This study is improving a Community Needs Response Models integrated with IoT concepts in order to reduce costs associated with identifying beneficiaries and essentials. This model will accelerate delivery rate and improving communications between all stockholders e.g. Local NGOs, representatives, delivery service providers, and monitoring agencies.

3 Methodology and Approaches

3.1 Accountability Model and Integration Approach

This work has performed a desk review, questionnaire, focused group discussions, and consultation with experts for each accountability component. The components of the accountability systems that this study has focused on during the assessment process are Organization, Systems, Data, Communication and Quality management. The assessment has been performed for each component and its implementation mechanisms in order to secure continuous service improvement and learning (Plan, Do, Check, Act) (Fig.1). Additionally, compliance of the utilities with the implementation of the different procedures, such as a feedback mechanism, solicitation of customers' opinions and dissemination of information to customers have addressed in detail. Having the right information at the right time is vital for the satisfaction and of building trust between customers and the service providers. Therefore, the study had a focus on the quality and continuity of updating the information that are communicated/accessed by customers and other stakeholders.

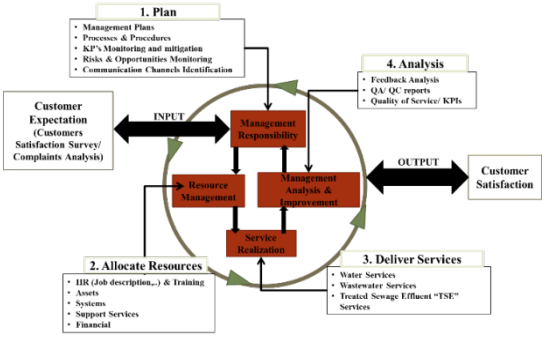

Fig.1: Conceptual diagram shows the different stages of the accountability system addressed during the second stage of the study aimed at assessing the processes to secure continuous service improvement and learning. The customer expectations, e.g. Obtained from satisfaction survey, complaint analysis, import as inputs through the customer services (CS) to the board and cycled to the resource management, service realization and goes to

© 2022 NSP
Natural Sciences Publishing Cor.

analysis for further action by the board. The process ends by attaining customer satisfaction.

While assessing the existing procedures used by the utilities, we maintained the "Integrated Approach" between different procedures that are dedicated to handle bi-directional communication with customers (Fig.2). This is to ensure having no loose ends and nothing left for interpretations.

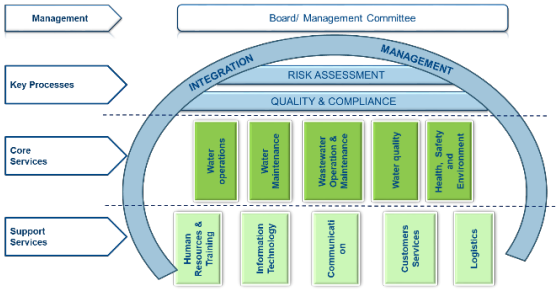

Fig.2: Conceptual diagram present main terms of the integrated approach for the assessment perspective. The Governance Organization divided into four levels: 1. Management (Board/ Management Committee), 2. Key Process (Risk assessment and quality assurance), 3. Core Services (water operations, water maintenance, wastewater operations and maintenance, water quality and health, safety & environment), and 4. Support Services (Human resources & training, information technology, communication, CSs, and logistics). The functions are integrated at the board level for assessing the processes of accountability within individual organizations. The Quality and Compliance shall act as the monitoring & a controlling tool for the Board/ Management Committee to secure tight integration between different processes all across the organization and timely escalation of any deviation.

3.2 Desk Review and Focused Group Discussion

Review of existing documents at the water utilities in Jordan and questionnaire survey is used for assessing the existing accountability systems and feedback mechanism between service providers (water utilities) and end users/communities at water utilities serving refugee camps in Jordan. The review process was performed to ensure whether the answerability mechanisms and flow of information need to be built, reactivated, reestablished or improved. Quality assurance and quality control have been implemented during all stages of the study to outline procedures for handling main activities such as i) how samples are selected for QA/QC check, ii) availability of records, performed analysis, mitigation and corrective actions taken, and subsequent modifications done in the process, and iii) how service interruption is communicated with public. This study has reviewed the deliverables provided by local organizations and documents available online and sources available at the utilities and developed a list of issues/documents for clarification, investigation, and collection.

Meetings with supervisors working in the water utilities in the operational fields has been conducted to assess competencies, accessibility to the policies, procedures and systems. Further meetings with managers have been conducted to assess the ability to monitor and control processes. Women stakeholders were involved in providing information if they are involved in the management of the deliverable services, and how their need and requirements are addressed. Field campaigns have been performed to check for actions taken to make women understand their role in the management of water uses and if such action has been implemented regularly. During the field surveys, meetings with IT/customer management have been made to ensure availability of systems that facilitate feedback and the flow of information and communication between service providers and customers in both directions.

3.3 E-services and Customer Information System

Samples from receiving customers' calls and objections on bills and documents related to actions taken were collected, and communications with a random sample of customers to check their involvement while handling their issues by the service providers were performed. The presence of the accountability system and bonus scheme for achieving set Key Performance Indicators (KPIs) ''if exist'' has been investigated. The presence of special arrangements for handling women and customers with special needs was reviewed to investigate whether the accountability system had been designed to meet customers' needs. This study has checked and analyzed: i) the availability of bilingual arrangements (English/Arabic) for communicating customers' complaints, ii) the availability of accurate customers' data, iii) the presence of public relations department, roles description, communication, iv) the plan, competency, tools, budget, and its ability to implement efficient communication plans, and v) meetings conducted with customers particularly women and their contribution in services improvement.

A selected sample of customers was communicated to assess reliability and sufficiency of their data in the CIS system. Further communication was performed to assess availability of help desk services to support maintainability and operability of existing IT systems. The existed contingency/ emergency response plan was conducted from the water utilities and assessed in order to verify whether they meet the outcomes of the proposed accountability model. The emergency response plan at the water utilities has been reviewed to ensure having the required organization and resources ready to function during crises/emergencies. This should describe the organization and resources allocated for handling crises/ emergencies to secure continuity of services and proper communication with customers during such abnormalities, particularly during the flood of complaints (mass complaints management).

© 2022 NSP
Natural Sciences Publishing Cor.

3.4 Quality Check and KPIs

Data obtained from the survey outcome, questionnaires, focused groups and random samples of customers were reviewed and analyzed. The differences between systems, procedures, and processes followed by the different service providers have been reviewed to assess consistency in the management service delivery. The existing accountability systems and functions were assessed during the gab analysis that include coverage, efficiency, accessibility, integration with other systems and databases. This study included an analysis of the ability of the water utilities to implement planned mitigation actions during crises to ensure customers satisfaction, as well as staff organization, sufficiency, competency and related trainings. During the analysis, existing KPIs were counted such as service continuity such as how it is measured, achieved and calculated. The existing incentive schemes and how they are linked to the performance and ultimately its impact on achieving a set of KPIs were reviewed to ensure that KPIs are activated during service assessment. This study investigated having and applying an efficient quality assurance model that supports continuous service improvement process. This shall include the presence of a competent, quality and compliance management team and its organization. Investigations also included a quality management plan, the presence of approved quality processes and procedures, tools and equipment to perform quality checks, quality reports and recommendation, and management support to the quality and compliance team in putting their recommendation in place. Complaints and feedback analysis is necessary for better performance and transparency towards end users and communities. Therefore, the complaints and feedback analysis has been reviewed as done by water utilities. This includes previously conduct "Customer Satisfaction Surveys", KPIs baselines, annual targets, current levels, decisions taken by management and actions taken by the utilities based on analysis done.

3.5 Study Limitation

The study limitation includes i) the limited available studies about the existing accountability systems for Jordan's water utilities, ii) lack of information about existing ERP systems and communication mechanism, iii) time limitation; this study has been designed for a small size of the population, and iv) scarcity of data available on the internet or other free sources about any previous reports discussing the accountability systems adopted by Jordan's water utilities. The list of recommendations and results have been discussed and developed during the two-day workshop with expertise who are working in the water sector. The workshop has been designed for 22 experts to address the importance of each function of the accountability model for further action.

4 Results and Discussion

There was no baseline study addressing the accountability systems existed between water users and governance bodies for refugee camps and during emergencies. The provided documents by local organization and agencies have not discussed the accountability systems at the targeted water utilities. On the other hand, and based on the available documents, it has been noticed that there was no focused study aiming at improving the existing accountability systems between water utilities and end-users targeted refugee camps and/during emergencies. Furthermore, the author could not find any study or proposal for improving the accountability systems at the water utilities that cover the proposed model items. Through the stages of the study, an accountability model has been structured and utilized through qualitative and quantitative survey methods as well as through discussion with officials and experts (Fig. 3). The model consists of five major components: Organization, Systems, Data, communication and Quality management. The model was designed for the utilities as a platform for continuous improvement of the existing accountability systems.

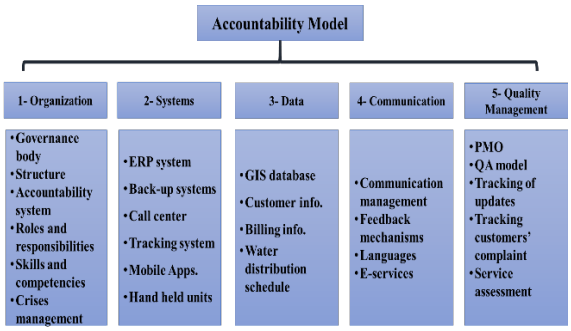

Fig.3: Conceptual diagram of the proposed accountability model. The model consists of five major components: Organization, Systems, Data, Communication, and Quality management. Each component has been designed to be used in any future e-services development projects.

4.1 Organization and Job role

The results indicated that there was a board/management committee in the water utilities, where customers and women have formed 10% of these committees. 75% of the survey population in the utilities emphasize the importance of having a regular monitoring program for KPIs for different business functions involved in delivering services to customers. However, there is an employed KPI for monitoring complaints at the utilities in low temporal resolution like how many problems are solved form the total calls. While 72% of the surveyed people agreed that there is an approved organization structure at the water utilities with role description for each business function involved in delivering services to customers, they have suggested reviewing the structure with a better description of role for each business function in relation to the

© 2022 NSP
Natural Sciences Publishing Cor.

delivered services to ensure that they are customer oriented in emergency cases specifically. 85% of the surveyed people, excluding women NGOs surveyed people, indicated that there is a job description for staff involved in delivering services to the costumer and the staff have a copy of it. Women NGOs indicated that they have no idea about the availability of the job description for the utility's staff. However, all of the surveyed customers and women NGOs agreed that they do not have an idea about the specific roles of the staff and if they are following their job roles and the announcement of job roles may be improved. Not only customers and women NGOs, but also the staff at the water utilities indicated the importance to have a training to meet Job requirements in relation to CSs and in communicating with customers during emergencies.

57% of the surveyed people at the water utilities answered that the emergency/ contingency response plan need to be improved and activated to secure continuity services during crises and emergency situations. 70% of the survey population stated that they do not have an idea about the presence of an emergency/ contingency plan, while the rest (30%) indicated that they do not have any idea about the efficiency of the existing plan. The surveyed population indicated the importance to establish an emergency response plan. The results confirmed that crises plan need to be developed, and deploy an emergency/contingency response plan for emergency cases and lockdowns, and allocate required resources for implementation of the contingency plan including communication tools to facilitate communication with customers during emergencies. Train staff on the implementation of the contingency response plan targeting staff call center, CSs, front office and operation & maintenance, and conducting the required rehearsals has shown its importance in the national scale Table 1.

A Board/ Management committee should be in place to manage the water utility at the strategic level. Key stakeholders, such as, customers, women, the private sector may also be represented in the board. The board/ management committee should be accountable for the development and approval of the annual business plan and functional/ departmental management plans incorporating KPIs, baselines, targets, ... Subsequently, the board/ management committee will monitor and control the utility performance through the set of KPIs and take necessary mitigation measures to mitigate deviations in performance. The board/management should also develop an annual business plan and a management plan for each business function; this is important to ensure that performance of different functional units is monitored and appraised. It is also recommended to establish a set of customer oriented KPIs that performance levels in emergency cases for instance. There was a need for regular monitoring performance against established KPIs and enforce mitigations for the lagging KPIs.

The approved organization structure and its different roles in relation to services provided, such as the front office/back office arrangements and its lines of communication within the water utility and with customers have been analyzed to identify gaps in the structure. The functional structure describes the roles of different business functions (Operation, Maintenance, CSs,) that are involved directly in delivering services to customers and the interfaces between them. Update the organization structure and the role of each business function is essential to insure that they are customer oriented within the water utilities during normal and emergency cases. However, training of staff involved directly in delivering services to customers on the role of their business functions and interfaces between them was highly recommended for utilities to accelerate the response rate during emergency cases.

Governance body and activity based organization describe the way business functions are organized based on activities while implementing processes for delivering services. It has been the case in several utilities in the country and in the region that customers suffer, and services interrupted by a sequence of bureaucratic procedures due to the involvement of several business functions in delivering a single service. With this background, the existing processes, interfaces between different business functions and how each service is delivered has been studied.

The results indicated the need for water service providers to i) improve processes or even restructure the existing organization or processes, so eventually to have, as much as possible, a one single point (one stop shop) for delivering each type of services, ii) develop customers oriented and activity based process and procedures for different business functions involved in delivering services to customers (functional managers are the targeted group), and iii) train the targeted groups of staff involved in delivering services to customers, on the development and implementation of the processes and procedures. See Table 1.

The importance of describing roles and responsibilities of each staff involved in service delivery and the interface with other staff within and outside the business function has been investigated at the water utilities. Investigations have been made to the presence of a job description (approved by management/ quality & compliance business function) with each staff involved directly in delivering services to customers and their understanding & compliance with their roles. Identifying staff involved directly in delivering services customers: e.g. Staff from call centers, CSs, front office and operation & maintenance is highly recommended with reviewing their existing job description to ensure they are customer oriented and approved by the competent authority. Furthermore, train the identified staff on their roles & responsibilities and perform rehearsals is essential to secure their full understanding to each step defined in the employed processes and procedures during emergencies. See Table 1.

Skills and competencies for a random sample of staff involved in delivering services to customers was verified against requirements. This has been measured the capability of each staff to perform the duties in the most efficient

© 2022 NSP
Natural Sciences Publishing Cor.

manner and in accordance with the requirements stipulated in the employee's job description. Based on findings, the study revealed the importance to i) identify staff involved directly in delivering services customers, ii) conduct gap analysis between job requirements and present competencies, and iii) bridge the gap in skills and competencies for the different staff involved directly in delivering services to customers e.g. Staff from call center, CSs, front office and operation & maintenance. See Table 1.

4.2 Systems and e-services

The majority of the surveyed people (88%) from the water utilities and customers agreed that there is an existing Enterprise Resources Planning (ERP) system at the water utilities. The water utility staff in utilities agreed that such system was an essential tool to facilitate an integrated and efficient management of CSs as these systems have limited modules coverage. 75% of the survey population of the water utilities (confirmed by qualitative questionnaire) indicated that there are backup system and IT emergency team, while all surveyed customers and women NGOs agreed there was a delay in delivering services during system outages.

Focused groups stated that water utilities regularly evaluate the call centers and they have a simple KPI for monitoring different activities. However, the existing KPIs measure only the percentage of solving complaints to the total number of complaints. Surveyed managers recommended developing and deploying new KPIs to monitor all activities and regularly display online performance levels. It has concluded during the survey that there are no mobile apps used by the water utilities at governors that are linked to the existing ERP systems to enable field staff to manage complains, update customer database and locate complains as well. The same conclusion is made from customers and women NGOs, where they have recommended providing accessibility to customers, enabling them to log in and provide wide information about their complaints, such as leakage, pollution, breakages. Moreover, field staff could be equipped with hand held units to support them in collecting accurately and to facilitate automatic uploading of information to the existing ERP system. This result based on the discussion with managers, experts and customers.

The presence of an ERP system with its different modules, such as Customer Information System "CIS" and GIS system, that facilitates an integrated and efficient management of customer oriented services has been investigated. The study recommends further improvement (deployment of new modules...) of the existing system or a new system. Deploying additional modules (such as business intelligence, GIS and CIS) to the financial accounting system and integrate them with the existing modules to address customer information and management issue and to facilitate integrated and efficient management of CSs is highly recommended. Further recommendation includes connecting staff and train them on relevant ERP modules. See Table 2, Point 1.

Backup systems should be made available to support continuity of services and maintainability/ security of the systems. The study checked the availability and operability of backup for different systems in use. However, no action is taken by the water utilities for improving the existing Backup systems (Table 2, Point 2). The presence and performance of call centers that handle and track customers' complaints, and investigated functioning, obstacles and potential improvements has been evaluated with the provision of collecting feedback from customers (online assessment, suggestion box) to the water utilities about level of services and suggestions for improvement of services.

Assessing the organization, resources and performance of the existing call centers at the water utilities is highly recommended action for the human resources business functions. Further action includes training of staff involved directly in delivering services to customers (Table 2, point 3). During the investigation of the availability and use of tracking systems as tools to track activities, e.g. Complaints handling, field staff movements, while monitoring & controlling them efficiently and remotely we proposed improvement to the existing system or propose a new system. This could be achieved by developing a tracking system by the board/ management committee to monitor complaints and field staff (Table 2, point 4). Through mobile tablets connected remotely to the ERP system, field staff can use it for i) complaints management, ii) retrieving and uploading data related to customers, iii) and locating complaints through GPS.

Deployment of Mobile Application will help in expediting the transfer of information from field staff to the ERP system and subsequently to customers. Therefore, customers will continuously have an updated information for easy access action during emergencies. The study investigated the deployment of Mobile Applications and came with a proposal to enhance or create new application. The recommended action has included developing on mobile apps to improve staff efficiency and provide on time information to staff and customers (Table 2, point 5). Deployment of Handheld Units/tools will help in expediting the transfer of information from meter readers to the ERP system and subsequently to customers. These are tools supporting field staff in collecting data accurately with little possibility of human errors. Therefore, customers will have the billing information updated almost within one or two days from the time meter reading is taken. Our recommendations included of deploying handheld units and integrating them with ERP system to support field staff in collecting data quickly and accurately. Training of field

© 2022 NSP
Natural Sciences Publishing Cor.

Table1: Description of each component under organization and respective action should be taken for each targeted group.

	Description/Item	Recommended Actions	Targeted Group
1	Presence of Board/ Management Committee for the water utility at the governorate or at the corporate level and if customers and women are well represented in the board to ensure that the accountability is well governed at the top management level.	Regular review of the management structure at the utilities level and involve customers and women	…… Board/ Management Committee
2	Presence of annual management plans (O&M, customer services, …,etc.) developed by involving key stakeholders including customers, and approved by the board/ management committee	Develop annual service delivery plan for each business function	Board/ Management Committee
3	Presence of approved and regularly monitored performance indicators (KPIs) for different business functions involved in delivering services to customers and mitigations for lagging KPIs	1. Develop key performance indicators (KPIs) and establish baselines for the different business functions particularly KPIs related to customer services. 2. Regularly monitor the performance and ensure having mitigation actions implemented for the lagging KPIs.	Board/ Management Committee
4	Presence of approved organization structure with a description of roles for each business function in relation to services provided	1. Review the existing organization structure and the roles of each business function to ensure that they are customer oriented. 2. Establish a Quality & Compliance business function within the organization. 3. Training of staff involved directly in delivering services to customers on the roles of their business functions and interfaces between them.	1&2. Board/ Management Committee 3. Staff from call center, customer services, front office and field teams
5	Presence of approved processes and procedures related to customer services, take into consideration the ‘’Activity Based Model’’ to secure smooth and uninterrupted delivery of services	1. Develop customers oriented and activity based processes and procedures for the different business functions involved in delivering services to customers. 2. Training of staff involved directly in delivering services to customers on the development and implementation of the processes and procedures.	1. Functional managers in coordination with the Quality & Compliance business function 2. Functional managers from call center, customer services, front office and operation & maintenance
6	Presence of job description (approved by management/ quality and compliance business function) for staff involved in delivering services to customers and if a copy of the job description is delivered and explained to each employee.	1. Review the existing job descriptions to ensure that they are customer oriented and approved by the quality and compliance business function. 2. Training of staff involved directly in delivering services to customers on their roles.	1. Functional managers in coordination with the Quality & Compliance business function 2. Staff from call center, customer services, front office and operation & maintenance
7	Training for meeting job requirements in relation to customer services and in communicating with customers.	1. Conduct gap analysis for job requirements and bridge the gap in skills and competencies for the different staff involved directly in delivering services to customers. 2. Training of staff on communicating with customers (customers management)	1. Human resources business function in coordination with functional managers. 2. Staff from call center, customer services, front office and operation & maintenance
8	Presence and efficiency of emergency/ contingency response plan and required resources to secure continuity of services during crises and emergency situations.	1. Review/ develop and deploy emergency/ contingency response plan incorporating required resources to mitigate impacts. 2. Training of staff and conducting rehearsals on the implementation of contingency response plan	1. Management board/ committee. 2. Staff from call center, customer services, front office, operation & maintenance and communication & media

© 2022 NSP
Natural Sciences Publishing Cor.

Table 2: Description of Each Component Under System and Respective Actions Should be taken for Each Targeted Group.

	Description/Item	Recommended Action	Targeted Party
1	Presence of an efficient ERP system to facilitates an integrated and efficient management of customer services.	1. Deploy additional modules (such as business intelligence, GIS, CIS,..) to the Financial Accounting System (FAS) and integrate them with the existing modules to address customer information and management issues and to facilitate integrated and efficient management of customer services. 2. Connecting staff and training them on relevant ERP modules	Board/ management committee
2	Presence of data back-up system and IT emergency team.	No action required	
3	Availability and performance of the call center/s in the governorate	1. Assess the organization, resources and performance of the existing call center. 2. Train call center staff to promote their skills in communicating with customers	HR business function
4	Availability of tracking system as a tool to track activities such as complains handling, field staff movements,…	Deployment of tracking system to monitor complaints and field staff	Board/ management committee
5	Availability of mobile apps. connected remotely to the ERP system to enable field staff in managing complaints, retrieve and upload data related to customers, locating complaints through GPS, ...etc.	1. Deployment of mobile apps to improve staff efficiency and provide on time information to staff and customers. 2. Training of field staff on the use of mobile apps.	Board/ management committee
6	Deployment of hand held units to support field staff in collecting data accurately and to facilitate automatic transfer of information to the ERP system.	1. Deployment of handheld units and integrate with the ERP system to support field staff in collecting and uploading data quickly and accurately. 2. Training of field staff on the use of handheld units	Board/ management committee

staff (e.g. from call centers, CSs, and from office and operation and maintenance) on the use of hand held units are highly recommended and is highly important during accountability system deployment (Table 2, point 6).

4.3 Data and Supply Estimation

Having an updated and accurate GIS database will improve the communication process and flow of information between customers and water utilities during emergency cases. However, the data will incorporate the necessary information required for managing CSs, such as: complaints, billing, consumption rate, the study concluded that the mechanism for updating the GIS database is a key during service delivery in emergency cases. 69% of the survey population indicated the need for regular actions taken for updating a customer's database and such actions are needed to facilitate service improvements for improving the accountability systems. All surveyed customers and women NGOs stated that their information on the water utilities are not regularly updated. 80% of the surveyed managers in the targeted areas indicated the importance of establishing approved and enforced procedures for updating customer's data/information. However, during the discussion with experts there was a suggestion to assess the level of billing management on regular bases. One of the main findings is that the surveyed people from the water utilities and customers agreed that the updated water supply schedule should be communicated to customers in case of changing during emergencies for instance. Further, customers believe that mobile apps, social media, web services can be efficiently used for communicating the updated water schedule be a part of upgrading accountability system.

Customer data, including customer contact details, plot number, building size & dimensions, customer classification (commercial/ residential). This has been an old issue with the water utilities, for example the size of buildings used for calculating wastewater connection fees

© 2022 NSP
Natural Sciences Publishing Cor.

Table 3: Description of Each Component Under data and Resective Actions Should be taken for Each Targeted Group.

	Description/Item	Recommended Action	Targeted Party
1	Presence of an efficient ERP system to facilitates an integrated and efficient management of customer services.	1. Deploy additional modules (such as business intelligence, GIS, CIS,..) to the Financial Accounting System (FAS) and integrate them with the existing modules to address customer information and management issues and to facilitate integrated and efficient management of customer services. 2. Connecting staff and training them on relevant ERP modules	Board/ management committee
2	Presence of data back-up system and IT emergency team.	No action required	
3	Availability and performance of the call center/s in the governorate	1. Assess the organization, resources and performance of the existing call center. 2. Train call center staff to promote their skills in communicating with customers	HR business function
4	Availability of tracking system as a tool to track activities such as complains handling, field staff movements,…	Deployment of tracking system to monitor complaints and field staff	Board/ management committee
5	Availability of mobile apps. connected remotely to the ERP system to enable field staff in managing complaints, retrieve and upload data related to customers, locating complaints through GPS, ...etc.	1. Deployment of mobile apps to improve staff efficiency and provide on time information to staff and customers. 2. Training of field staff on the use of mobile apps.	Board/ management committee
6	Deployment of hand held units to support field staff in collecting data accurately and to facilitate automatic transfer of information to the ERP system.	1. Deployment of handheld units and integrate with the ERP system to support field staff in collecting and uploading data quickly and accurately. 2. Training of field staff on the use of handheld units	Board/ management committee

which is changing with no updates in the customer's record, leading to a loss in revenues. The study reviewed the process and regularity of updating customers' information and based on findings proposed the improvement or development of a new process. Developing and deploying procedures to ensure continuous updating customers' data/information is a highly recommended action to CS business function at the water utilities in coordinating with the IT and quality and compliance business functions (Table 3. Point 3). It has recommended conducting comprehensive asset survey and update GIS database.

It is not uncommon to have old records of customers with no updates leading to huge error in billing (estimation of consumption) and consequently impacting customer satisfaction and utility revenues. The study investigated the accuracy of the billing information and the procedure put in place to support a sustainable updating process and proper handling of bill objections, which should be resolved correctly and quickly.

Billing information includes water meter number, meter reading history, bill objections, and payments. Reviewing all process and procedures related to billing management, including bills objections is highly recommended to CSs business function at the water utilities in coordinating with the IT and quality and compliance business functions (Table 3, point 4). Water supply in the utilities is not continuous and the water supply schedule is frequently changing. Such changes have to reach customers at the right time and in the right way to secure transparency with customers. Therefore, the study reviewed the process followed to announce the water supply schedule and its updates through the ERP/ Website/ public media, SMS messages during emergency shutdowns and other e-services. However, it is strongly recommended to operation and monitoring business function at the water utilities in coordinating with the IT and quality and compliance business functions developing and deploying a procedure to ensure continuous updating of the water supply schedule

© 2022 NSP
Natural Sciences Publishing Cor.

and facilitate its communication to customers/ online accessibility at all times. Table 3, point 5.

4.4 Communication and Feedback Analysis

It has been proposed to improve or develop procedures to achieve better performance and transparency for analyzing feedback and complaints during emergencies. The following actions have been recommended: i) developing and deploying a mechanism for customers' feedback analysis to secure buying from customers in the service delivery process and its continuous improvement, ii) training of staff on the implementation of the customers' feedback analysis and continuous improvement process, iii) filling in form in order to receive the services, and iv) online and self-assessment techniques, like those cheap instruments that take the satisfaction and suggestions from customers at the company facility. However, customers indicated the importance of having a systematic feedback mechanism and or easy access feedback methodology that covering broad customer samples, e.g. women, employee, etc. However, it has been recommended that the water utilities could use proper equipment, web services, multilingual voice calls to reach most of customers and get their feedback and services assessment.

The study investigated the presence of a communication plan that facilitates communication with customers during normal and emergency situations. Based on the findings, the communication plan should include, but not limited, to stakeholders, targeted audience, Organization and human resources, Communication methods, Risk assessment, and Required budgets. This study indicated the communication management plan at the water utilities may be reviewed and activated taking into account communication with customers, external and internal stakeholders during emergency. The further recommendation includes a training program for the staff involved in implementation of the communication plan. The training should include class training and rehearsal. Table 4, point 1. We investigated the provision of communication that facilitates feedback from end-users to the service provider about the level of services and their comments/ suggestions for service improvement. It has also tracked the course of actions taken while considering such comments/ suggestions until communicated back to the customers. However, developing and deploying a mechanism for customer feedback analysis to secure buying from customers in the service delivery process and its continuous improvement. The staff involved in CSs may trained on the implementation of customer feedback analysis and continuous improvement process. Table 4, point 2. The recommendation has directed to the management committee, CS, and Quality and compliance business functions for enforcing regular analysis of customers' feedback and presenting to the board/management committee to reinforce service improvement measures. This should reflect the tools made available to communicate with the targeted customers, which are mostly required for managing complaints and in both directions. The study investigated existing means of communication with customers, particularly customers with special needs and other foreigner speakers, and recommended improvements or implementation of new communication means. Developing and deploying a plan for communication with customers is highly recommended action. The further recommendation includes training concerned staff on the implementation of different communication methods. Table 4, point 4. The availability and efficiency of the existing communication means have been investigated. These communication tools, such as: landlines/ Cell phones/ SMS/ social media are used in both directions for managing customers' services (new connections, billing issues, payments, distribution schedule, supply interruptions, etc.). The investigation also addressed the presence of a contact list incorporating hotlines and other important contact information. Conducting surveys to the employed communication means by the organization and identification of additional communication means may facilitate better communication with customers and is highly recommended. Further actions should include developing and deploying procedures for regularly updating the contact list. Table 4, points 4 and 5.

Customers can process own services on their web account remotely through e-services under my profile, such as:

My bill,
Water schedule,
Complaints management,
Object bill

The existing services have been reviewed and studied the development of the existing system or proposed a new system that can facilitate improved customer e-services. The study also considered the presence of online assessment techniques for the delivered services. This study came with a number of individual and combined recommended actions directed to board/management committee, customers and CSs and IT business functions for: reviewing and expanding the existing e-services to facilitate better communication with different stakeholders, Encouraging customers to use available e-services, and Conducting shared training program for utility staff and targeted groups, such as women NGOs on the e-services.

4.5 Quality Management and Tracking System

72% of the surveyed population of the staff from water utilities indicated that there is a good quality and compliance organization within the water utilities' structure. Surveyed customers and women NGOs felt that quality and compliance organization and the services may be improved. There was consensus that the quality management model for monitoring and assessing CS processes,

© 2022 NSP
Natural Sciences Publishing Cor.

Table 4: Description of Each Component Under communication and Resective Actions Should be taken for Each Targeted Group.

	Description/Item	**Recommended Action**	**Targeted Party**
1	Presence of an approved communication management plan that facilitates communication with different types of customers	1. Review and activate annual communication management plan. This should take into consideration communication with customers, external and internal stakeholders during normal and emergency situations. 2. Training of staff involved in implementation of the communication plan. This should include class training and rehearsals.	Board/ management committee
2	Presence of a mechanism for customer feedback analysis.	1. Develop and deploy a mechanism for customers' feedback analysis to secure buying from customers in the service delivery process and its continuous improvement 2. Training of staff on the implementation of the customers feedback analysis and continuous improvement process	Board/ management committee
3	Level of actions taken by the organization to analyses customers feedback	Enforce regular analysis of customers' feedback and presenting to the board/ management committee to reinforce service improvement measures.	Board/ management committee, CS, Quality & Compliance
4	Presence of communication facilities for communicating with targeted customers which are mostly required for managing complaints	1. Develop and deploy a plan for communication with customers. 2. Provide required resources for the deployment of the communication plan 3. Train concerned staff on the implementation of different communication methods.	1&2. Management board/ committee 3. Communication management team
5	Communication means deployed by the organization (social media, SMS, landlines, cell phones, E-services,..)	Conduct survey to the employed communication means put in place by the organization and identify & deploy additional communication means that could facilitate better communication with customers.	Management board/ committee and Communication management team
6	Developing and maintaining an updated stakeholders/customers contact list to facilitate communication with customers during normal and emergency situations	1. Develop a stakeholders/ customers' contact list for key stakeholders to be made readily available. 2. Develop and deploy a procedure for the contact list regular updates.	Customer services business function
7	Availability and distribution of customers services centers present in the governorate	Review the number and distribution of the existing customer service centers in the governorate. The utility should consider establishment of new service centers to enhance services and facilitate better communication with customers	Board/ management committee
8	Level of E-services provided by the water utility to facilitate improved services and communication with customers	1. Review and expand the existing E-services to facilitate better communication with different stakeholders' 2.Encourage customers to use available E-services. 3. Conduct shared training programs for Utility staff and targeted groups, such as women NGOs on the E-services.	Customers and customer service & IT business functions

© 2022 NSP
Natural Sciences Publishing Cor.

Table 5: Description of each component under quality management and respective actions should be taken.

	Description/ Item	Recommended Action	Targeted Party
1	Build a Quality & Compliance business function within the utility organization to support the management for improving services	1. Revise the utility organization to incorporate "Quality & Compliance business function "which should preferably be reporting to the management board/ committee. 2. Develop the scope for the Quality & Compliance business function which should include the development and monitoring of performance indicators.	Board/ management committee, Quality & Compliance and HR business function
2	Presence and deployment of quality management model to support continuous improvement process.	1. Develop and deploy a quality management model to support the utility in its continuous improvement process. 2. Training of concerned staff (management level) on the development and deployment of the quality management model.	Board/ management committee and Quality and Compliance business function
3	Deployment of performance indicators to measure the efficiency of employees in communicating with customers	1. Develop performance indicators (KPIs) for communication with customers and set its baselines and annual targets. 2. Revise the utility incentive scheme to link with these new KPIs	Board/ management committee, Quality & Compliance and HR business functions
4	Conducting quality checks on the utility data updates.	1. Develop and deploy procedures for conducting quality checks on the utility database updates. 2. Present to the board/ management committee results of quality checks and implement decisions taken to secure compliance of the different parties with the updates.	Board/ management committee, Quality & Compliance and HR business functions
5	Presence of a robust tracking system that enables the utility to track customer complaints	Develop and deploy a tracking system for tracking customers' complaints.	CS, IT, O&M
6	Mechanism put in place by the organization for conducting complaints and feedback analysis.	1. Develop and deploy a mechanism for customers feedback analysis to secure buying from customers in the service delivery process and its continuous improvement 2. Training of staff on the implementation of the customers feedback analysis and continuous improvement process	CS, O&M, Quality & Compliance business functions

flow of information, and other customers' related actions in the surveyed areas (e.g. CSs KPIs) is essential in the accountability processes. However, 85% of the surveyed utility staff indicated that such model exists for many activities in their organization, e.g. the financial accounting system, but not for supporting continuous improvement of CSs. This quality management model will indirectly support continuous service improvement processes by linking a variety of database through specific model/s for instance.

All people involved in this study consensus that KPIs that measuring the efficiency of employees in communicating with customers need to be improved. Both customers and water utilities agreed that KPIs would improve the utilities' accountability and contributing to accelerating the response time for many actions e.g. during crises. 90% of the surveyed population indicated that quality checks conducted on customers' data updates are helping supply services. This point has linked with customers' data updating process that discussed earlier. 81% of the surveyed population indicated that a robust tracking system, that enables the utility to track customer complaints, requests, inquiries, will improve the response plans during supply fail for instance.

Developing the scope of the quality and compliance business functions that should include the development and monitoring of performance indicators should be considered in any accountability model. Table 5, point 1. Tracking of update actions will secure accuracy of the water utility database and continues updating that has strong impact on the level of services and subsequently customers' satisfaction. Therefore, we collected and analyzed samples of quality checks conducted by the Quality team and investigated the regularity and accuracy of different updates (customer information, GIS database). Developing and deploying procedures for conducting quality checks on the utility database updates was highly recommended. See Table 5, point 4. Managing customers' complaints are of great importance to water utilities. Therefore, the study reviewed the system put in place to track complaints (complaint management system, dashboards, KPIs) and the escalation mechanism of priority/ delayed complaints employed by the utilities. However, developing and deploying a tracking system for tracking customers' complaints is highly recommended action to CS, IT and operation and maintenance (O&M) business functions. See Table 5, point 5.

5 Conclusions

This study proposed an accountability system for improving water services during emergency cases. The model consists of five major items: Organization, System, Data, Communication, and quality management. Each item under the presented accountability model has been

© 2022 NSP
Natural Sciences Publishing Cor.

discussed in order to improve services and data accessibility and update. This study investigated whether the existing accountability systems at the water utilities have the items listed in the proposed accountability model and if the staff are well trained to meet the model's requirements in normal and emergency cases. Recommended actions and targeted groups are determined based on FGD and interviews. The study defined the areas of training and the job roles which must be identified in the job description of staff working in CS in the water sector. Based on the results, the priority of taking action has also listed based on the empirical relationship of criticality and frequently with priority, where:

$$Priority = Frequency \times Criticality$$

The results came up with two paths of recommendation based on the targeted pillars of the accountability model. The first is improving data and services provided to customers that highlighted the importance of improving the existing KPIs of different processes of CSs. The interviewed people indicated that the existing organization structure and the role of each business function need to be improved to ensure that they are customer oriented. Deployment of tracking system, geographic information, data update, and feedback analysis need to be integrated with e-tools for instance using IoT in the water sector. The second is improving facilities, tools and workers of the water utilities. The improvement may consider training in delivering services, IoT in process management, regular data analysis of complaints, improving communication tools and mechanisms. This path consists of recommendation in expanding e-services to facilitate better communication with different stakeholders, tracking complaints and community needs during emergencies. Further researches are needed to develop and deploy quality management model to support the utility in its continuous improvement process.

Acknowledgments

This work was supported by Ajloun National University. The Author thanks OXFAM for their fund.

References

[1] Degefu DM, Weijun H, Zaiyi L, Liang Y, Zhengwei H, Min A. Mapping Monthly Water Scarcity in Global Transboundary Basins at Country-Basin Mesh Based Spatial Resolution. *Sci Rep.* 2018;**8(1)**:2144. doi: 10.1038/s41598-018-20032-w.

[2] He C, Liu Z, Wu J, Pan X, Fang Z, Li J, et al. Future global urban water scarcity and potential solutions. *Nature Communications*. 2021;**12(1)**:4667. doi: 10.1038/s41467-021-25026-3.

[3] Boufides CH, Gable L, Jacobson PD. Learning from the Flint Water Crisis: Restoring and Improving Public Health Practice, Accountability, and Trust. *J Law Med Ethics.* 2021;**47(S2)**:23-6. Epub 01/01. doi: 10.1177/1073110519857310.

[4] M. Malkawi ZA-G, Z. Alshboul, A. Al-Yamani, O. Murad,. Internet of Things Based Monitoring System of Leaks in Water Supply Networks Using Pressure-Based Model. *Information Sciences Letters*. 2022;**11(2)**: 495-500. Epub 500. doi: doi:10.18576/isl/110219.

[5] Rogers P. Water governance, water security and water sustainability, *Water crisis: myth of reality*. 2006. p. 3-36.

[6] Walker C, editor Lack of Safe Water, Sanitation Spurs Growing Dissatisfaction with Government Performance, available: https://www.afrobarometer.org/wp-content/uploads/migrated/files/publications/Dispatches/ab_r6_dispatchno76_water_and_sanitation_in_africa1.pdf , 2016.

[7] Programme UND. Overview: Beyond scarcity power, poverty and the global water crisis. Human Development Report 2006: *United Nations*; 2006.

[8] Arnold T, Gosnell H, Benson M, Craig R. Cross-interdisciplinary insights into adaptive governance and resilience. *Ecol Soc*. 2017;22. doi: 10.5751/ES-09734-220414.

[9] Wang C-HB, J.; Wang, X.; Yum, K.-K.; Zhou, M. Overview of Resilience Concepts, with Application to Water Resource Systems. *Water Cooperative Research Centre.* 2009;Canberra, Australia.

[10] Roach T, Kapelan Z, Ledbetter R. A Resilience-Based Methodology for Improved Water Resources Adaptation Planning under Deep Uncertainty with Real World Application. *Water Resour Manage*. 2018;**32(6)**:2013-31. doi: 10.1007/s11269-018-1914-8.

[11] Wang C-H, Blackmore J. Resilience Concepts for Water Resource Systems. Journal of Water Resources Planning and Management-asce - *J WATER RESOUR PLAN MAN-ASCE.* 2009;135. doi: 10.1061/(ASCE)0733-9496(2009)135:6(528).

[12] Jiménez A, Saikia P, Giné R, Avello P, Leten J, Liss Lymer B, et al. Unpacking Water Governance: A Framework for Practitioners. *Water*. 2020;**12(3)**:827. PubMed PMID: doi:10.3390/w12030827.

[13] Auditors ECo. European Union Development Assistance for Drinking Water Supply and Basic Sanitation in Sub-Saharan Countries. Special Report No13, Luxemburg. 2012. doi: www.eca.europa.eu/Lists/ECADocuments/SR12_13/SR12_13_en.pdf.

[14] Jiménez Fdez de Palencia A, Livsey J, Åhlén I, Scharp C, Takane M. Global Assessment of Accountability in Water and Sanitation Services Using GLAAS Data. *Water Alternatives*. 2018;11.

[15] Blühdorn I, Deflorian M. The Collaborative Management of Sustained Unsustainability: On the Performance of Participatory Forms of Environmental Governance. Sustainability. 2019;11(4):1189. *PubMed PMID*: doi:10.3390/su11041189.

[16] Facility/UNICEF UWG. Accountability in WASH: Concept Note, Accountability for Sustainability Partnership. *UNDP Water Governance Facility at SIWI and UNICEF*. 2015; Stockholm and New York. doi:

www.watergovernance.org/Accountability-for-Sustainability.

© 2022 NSP
Natural Sciences Publishing Cor.

[17] Marques RC, Pinto FS, Miranda J. Redrafting Water Governance: Guiding the way to improve the status quo. Utilities *Policy*. 2016;43:1-3. doi: https://doi.org/10.1016/j.jup.2016.11.002.

[18] Wuijts S, Driessen PPJ, Van Rijswick HFMW. Governance Conditions for Improving Quality Drinking Water Resources: the Need for Enhancing Connectivity. *Water Resour Manage*. 2018;**32(4)**:1245-60. doi: 10.1007/s11269-017-1867-3.

[19] Tropp H, Jiménez A, Le Deunff H. Water Integrity: From Concept to Practice. In: Karar E, editor. Freshwater Governance for the 21st Century. Cham: *Springer International Publishing*; 2017. p. 187-204.

[20] Gaventa J, McGee R. The Impact of Transparency and Accountability Initiatives. *Development Policy Review*. 2013;31**(s1)**:s3-s28. doi: https://doi.org/10.1111/dpr.12017.

[21] Gaventa J, Barrett G. Mapping the Outcomes of Citizen Engagement. *World Development*. 2012;**40(12**):2399-410. doi: https://doi.org/10.1016/j.worlddev.2012.05.014.

[22] Carlitz R. Improving Transparency and Accountability in the Budget Process: An Assessment of Recent Initiatives. *Development Policy Review.* 2013;**31(s1)**:s49-s67. doi: https://doi.org/10.1111/dpr.12019.

[23] Pahl-Wostl C, Knieper C, Lukat E, Meergans F, Schoderer M, Schütze N, et al. Enhancing the capacity of water governance to deal with complex management challenges: A framework of analysis. *Environ Sci Policy*. 2020;**107**:23-35. doi: https://doi.org/10.1016/j.envsci.2020.02.011.

[24] Flores Ó, Jiménez A, Pérez-Foguet A. Monitoring access to water in rural areas based on the human right to water framework: a local level case study in Nicaragua. International *Journal of Water Resources Development.* 2013;**29(4)**:605-21. doi: 10.1080/07900627.2012.757017.

[25] Francis P, James R. Balancing Rural Poverty Reduction and Citizen Participation: The Contradictions of Uganda's Decentralization Program. World Development. 2003;**31(2)**:325-37. doi: https://doi.org/10.1016/S0305-750X(02)00190-0.

[26] Cavill S, Sohail M. Accountability Arrangements to Combat Corruption. WEDC, Loughborough University. 2007. https://dspace.lboro.ac.uk/dspace-jspui/bitstream/2134/9593/2/Synthesis_Report_and_Case_Study_Survey_Reports_-_Complete.pdf

© 2022 NSP
Natural Sciences Publishing Cor.