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Measuring Progress of Recovery from People's Perception: A Study on Cyclone Aila Recovery in Koyra, Bangladesh

Md Shibly SADIK[(1)], Hajime NAKAGAWA, Rajib SHAW[(2)], Md Rezaur RAHMAN[(3)], Kenji KAWAIKE, Gulsan Ara PARVIN, and Rocky TALCHABHADEL

(1) Department of Civil and Earth Resources Engineering, Kyoto University
(2) Graduate school of Media and Governance, Keio University
(3) Institute of Water and Flood Management, Bangladesh University of Engineering and Technology, Bangladesh

Synopsis

This research presents the study on assessing cyclone Aila recovery in Koyra, Bangladesh. It aimed at measuring the progress of recovery from people's perception. A score-based quantification methodology was developed to this aim which included a series of focus group discussion and a scoring technique to construct synthetic recovery curve from peoples' perception. Prevailing condition of different sectors (local economy, coastal polders, etc.) in different years (2009, 2010, 2012, 2014, and 2017-18) since cyclone Aila hit was quantified following the score-based assessment technique. This allowed to illustrate the changes of sectoral condition as the recovery evolved. The research is still ongoing as a part of an academic programs. This paper only presents the initial findings of the recovery assessment with a case study on progress of economic recovery and recovery of coastal polder. The preliminary results show that there is a sign of improvement of economic condition than that of before Aila hit. On the other hand, the condition of coastal polder is weaker than before Aila.

Keywords: Cyclone Aila, Humanitarian Aid, Recovery, Bangladesh, People's perception

1 Introduction

Bangladesh has a long history of tropical cyclone related disasters. In last 50 years the country has experienced several devastating cyclone (in terms of human lives and economy) including Bhola Cyclone (1971), 1985 Cyclone, 1991 Cyclone, Cyclone Sidr (2007), and most recently Cyclone Aila (2009) (Shah Alam Khan 2008; Sadik, Nakagawa, Rahman, et al. 2017). The disaster management strategy of the country has been praised internationally for being gradually successful in saving human lives (Haque et al. 2012). There is a paradigm shift in disaster management policy from post-disaster response to pre-disaster preparedness which included establishing a network of volunteers, community awareness, dissemination of early warning, coastal afforestation, institutionalizing disaster management policies, etc. (Shah Alam Khan 2008; Haque et al. 2012; Sadik et al. 2018). Though saving human lives by executing an effective evacuation is still a central focus in cyclone risk management, the concept of post-disaster recovery to enhance community resilience is appearing in disaster policies and plans (DMB-MFDM 2010).

Historically, international humanitarian aid and NGOs have been playing an important role in disaster management of the country, especially in post-disaster recovery and pre-disaster preparedness (Khan and Rahman 2007). Humanitarian organizations have also changed their approach from post-disaster relief program to comprehensive livelihood recovery programs and pre-disaster preparedness programs (Khan and Rahman 2007; Haque et al. 2012; F. Mallick and Islam 2014).

With all of the efforts of government and humanitarian organizations, Bangladesh has successfully reduced the number of deaths caused by recent cyclones (Haque et al. 2012; Cash et al. 2013). On the other hand, apart from the reduction of death caused by a cyclone, damages including economic losses, infrastructural damage, and property damage

by cyclone are increasing with the trend of economic development. Thus post-disaster reconstruction and recovery become a vital component in disaster management.

The importance of systematic and comprehensive post disaster recovery had realized and somewhat practiced after two recent devastating cyclones: cyclone Sidr (2007) and cyclone Aila (2009) (F. Mallick and Islam 2014; World Bank 2014; Sadik et al. 2018). In both cases a recovery mechanism supported by the joint multi-development partners were established to promote multi-sectoral recovery. The recovery from the impact of the cyclone Aila was particularly interesting because of the nature of the cyclone damage and thereafter the joint effort of GO-development partner to promote multi-sectoral recovery to enhance resilience. There were several researches which critically examined the Aila recovery process from the perspective of pre-disaster vulnerability reduction (Sadik, Nakagawa, Rahman, et al. 2017; Sadik et al. 2018), role of social capitals (Masud-All-Kamal and Monirul Hassan 2018), adopted innovative approaches (F. Mallick and Islam 2014), etc. These researches revealed both weakness and strength of the Aila recovery which can inform policy making process. However, how is the final outcome of the recovery, and how it progressed over time have not been assessed yet. Measuring the recovery progress is necessary for strengthening mid-course correction process, evaluation of recovery decision, policy implication, and preparedness for next disaster (Rathfon et al. 2013). This research has been designed to assess the progress of cyclone Aila recovery in Koyra of Bangladesh.

Cyclone Aila struck south-western coast of Bangladesh on 25 May 2009. It was a severe cyclone with a hurricane core and at the time of land falling it attained maximum 65 knot sustained wind and minimum 974 mb mean sea level pressure (MSLP) (JTWC 2009) (Fig. 1). The cyclone induced a storm surge of 2m–6m which breached and overtopped earthen polders of several areas in south-western coast (ECHO 2009; IFNet 2009; UNDP 2010; B. Mallick et al. 2011; Sadik et al. 2017).

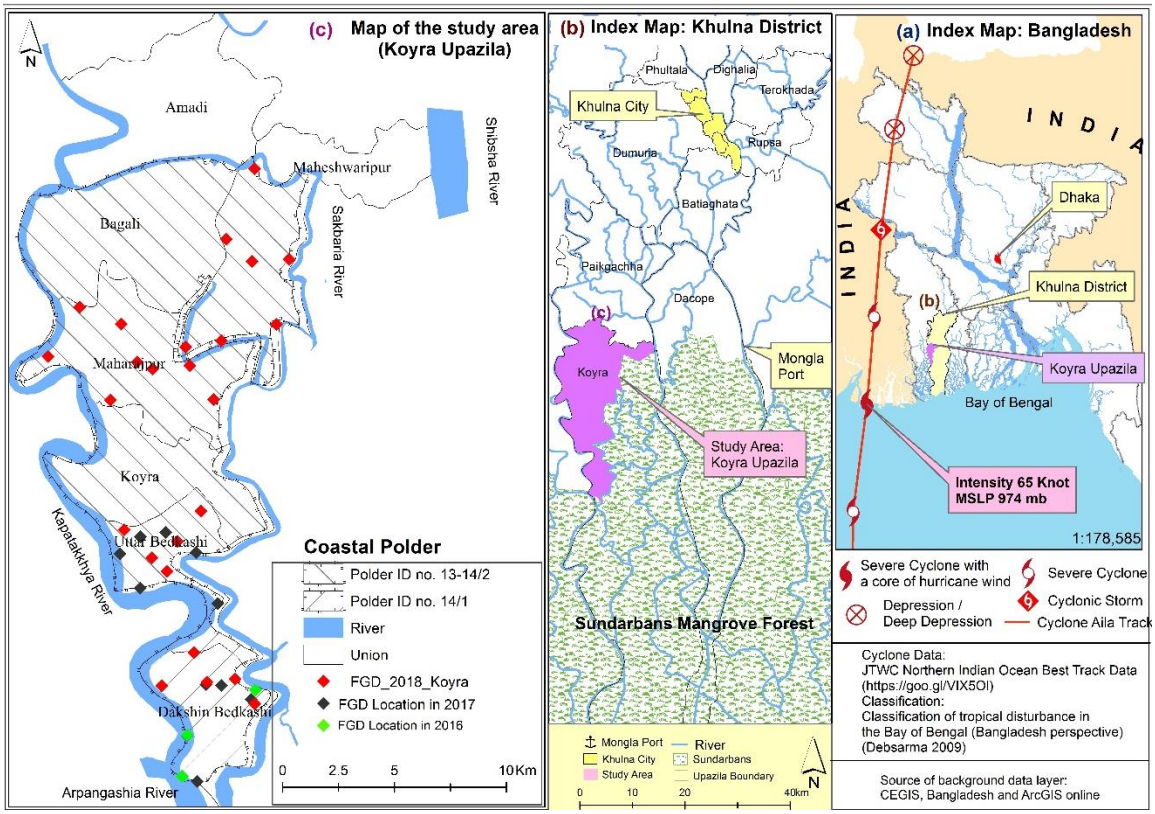

Fig.1: Map of the study area

Koyra upazila (a sub-administrative unit of a district) was one of the severely affected upazilas. 81 km of earthen embankment of Koyra was damaged including breaching at 34 places by the storm surge (Roy et al. 2009; Koyra Upazila Council 2010). The entire communication system in Koyra was suspended due to damage of 680 km earthen roads and 163.5 km of asphalt road, 49 bridge culverts (Koyra Upazila Council 2010). Death of 41 persons, damage of 42,440 houses, nine academic institutions, 192 religious institutions, 11,500 hectares of crops and 10,364 fish aquaculture farms, and continuing

tidal inundation due to damage of polders resulted in sever humanitarian crisis (ECHO 2009; Koyra Upazila Council 2010; Sadik et al. 2018). A study estimated that average household assets damage amounted to 115%–141% (low income to high income group) of annual their income(Abdullah et al. 2016).

In response to the humanitarian emergency, the government and international humanitarian organizations duly extended their humanitarian aids (UNDP 2010) to the affected area. Around 15 days after the cyclone hit, in June 2009, government appealed to its development partners for assisting in reconstruction and rehabilitation programs in Aila affected areas (IFRC 2010). Following the government's official appeal, different multilateral and bilateral development partners, international humanitarian organizations initiated a number of multi-sectoral recovery support programs to aid recovery of housing, economy, livelihoods, education, water supply, sanitation, hygiene and health (WASH), and infrastructure. The government both independently and jointly with development partners also initiated several programs for recovery of coastal polders, infrastructures, housing, etc. Their approach was praised due to adopting a systematic procedure of need assessment, planning, and bringing a national level coordination for implementation (F. Mallick and Islam 2014). On the other hand, it was also criticized due to lack of inclusion of pre-Aila vulnerability reduction measures, lack of local level coordination (Sadik, Nakagawa, Rahman, et al. 2017; Sadik et al. 2018), corruption (Mahmud and Prowse 2012) and insufficient inclusion of social capital (Masud-All-Kamal and Monirul Hassan 2018).

This research aimed at measuring the progress of recovery in different sectors e.g. economy, water supply, housing, etc. with the objective of answering the following questions:

1. How is the present condition of the community with a comparison to pre-Aila time?
2. How is the present condition of the community with comparison to "resilient community" which is theoretically the outcome of "build back better" (Mannakkara and Wilkinson 2014; Mannakkara and Wilkinson 2016)
3. How has the recovery been progressing over time?

Since Bangladesh is maneuvering its development process towards disaster resilient development with focus on pre-disaster preparedness, this kind of research on on-going recovery inform decision making process. The methodological approach adopted for this research would also guide disaster researchers and planner for conducting mid-way evaluation of disaster recovery in developing countries, where integrated database of pre-disaster baseline condition and post disaster monitoring are insufficient.

The overall research is a part of the doctoral academic program. In this paper only the preliminary results of assessing recovery progress of economy and coastal polder would be presented.

2 Study Area

The study area covered four unions (administrative sub-unit of an upazila) of Koyra upazila (Fig.1). Koyra was considered as the study area for two reasons: i) it was one of the severely affected areas, ii) it was also a prioritized area for recovery programs.

Koyra is the most southern upazila of Khulna district. It is at the border of Sundarbans, the world's largest mangrove forest. It is separated from its neighbors by Kapotakkhya River at west and Sakbaria River at east (Fig. 1). In 1967-1970, government empoldered the upazila by earthen embankment to protect agricultural crop from tidal flood. At the time of cyclone Aila, storm surge breached and overtopped the earthen embankment at several places and inundated almost entire upazila which led the devastation as described earlier.

3 Methodology

Generally measuring the progress requires a wide range of time series data of multi-disciplinary indicators and supported by a very detail survey and pre-disaster census data (Tatsuki 2007; Horney et al. 2017). Lack of pre-disaster census data and during-recovery integrated monitoring data in developing countries often discourages measuring recovery progress. International humanitarian organizations involved in disaster recovery in developing countries often conduct monitoring and evaluation of their own projects only on ad-hoc basis. Similarly, in Bangladesh, at the time of Aila recovery NGOs conducted their own evaluation on ad-hoc basis as a requirement of their donors (e.g. Walton-Ellery 2009; De Silva and Shafie 2014). Such, evaluations were limited to their project related activities only and did not provide detail data. Even those evaluations did not evaluate outcome of the recovery and perception of local people. Therefore, in absence of any comprehensive and integrated data base, it was very difficult to measure recovery progress. For this research we therefore adopted a mixed approach

consisting institutional survey, expert interview, and focus group discussion.

3.1 Institutional Survey and Expert Interview

We conducted an institutional survey to identify institutions involved in Aila recovery. Since the number of institutions were not recorded in any database or in local government offices, we applied snowball technique (Goodman 1961). We first visited one institute, interviewed a responsible experts, collected necessary data and got information of another institutes for next survey. In such manner, we surveyed 12 institutes and identified 13 NOGs involved in Aila recovery.

Institutional survey helped to construct a matrix of recovery activities and implementing institutes (Sadik et al. 2018). It helped to identify different recovery initiatives implemented by different institutes in different sectoral recovery.

3.2 Focus group discussion

A series of informal focus group discussion (FGD) was conducted in the study area in 2016–2018 with local people. First in 2016 four FGDs were conducted to understand the overall storyline of the Aila and to construct questionnaire for assessing recovery progress. Thereafter in 2017–2018 a total of 35 FGDs were conducted in 35 villages of four unions of Koyra (Fig. 1). FGDs were conducted with local people who were direct and indirect beneficiaries of recovery programs. Villages were selected purposively considering accessibility, abundance of settlers, evidence of implemented recovery programs (e.g. newly constructed houses, reconstructed roads, reconstructed embankments, etc.). Numbers of participants varied depending on location and time of conducting FGD. Maximum number of participants was 28 found in Shree-rampur of Maheswaripur and lowest number was 7 found in Gazipara village of Dakshin Bedkashi. The FGDs were administrated by a pre-developed, and pre-tested questionnaire.

3.3 People's perception-based scoring technique for measuring recovery

A structured questionnaire was developed for assessing recovery progress by people's perception. The questionnaire consisted of one basic question about recovery – "how was/is the condition of 'a sector in following five time period: before cyclone Aila, immediately after Aila (May 2019), one year of Aila (2010), three years of Aila (2012), five years of Aila (2014) and at present (2017/2018)" (Fig. 2). These flagged years corresponded to years when different major recovery programs (e.g. emergency response and relief, rehabilitation of embankment, reconstruction of housing projects, etc.) were ended. Thus it helped the participants of FGD to remember the past. From the experience of field testing of questionnaire it was understood that local people could easily correlate past condition to any major recovery events like completion of polder rehabilitation, completion of a road reconstruction, etc.

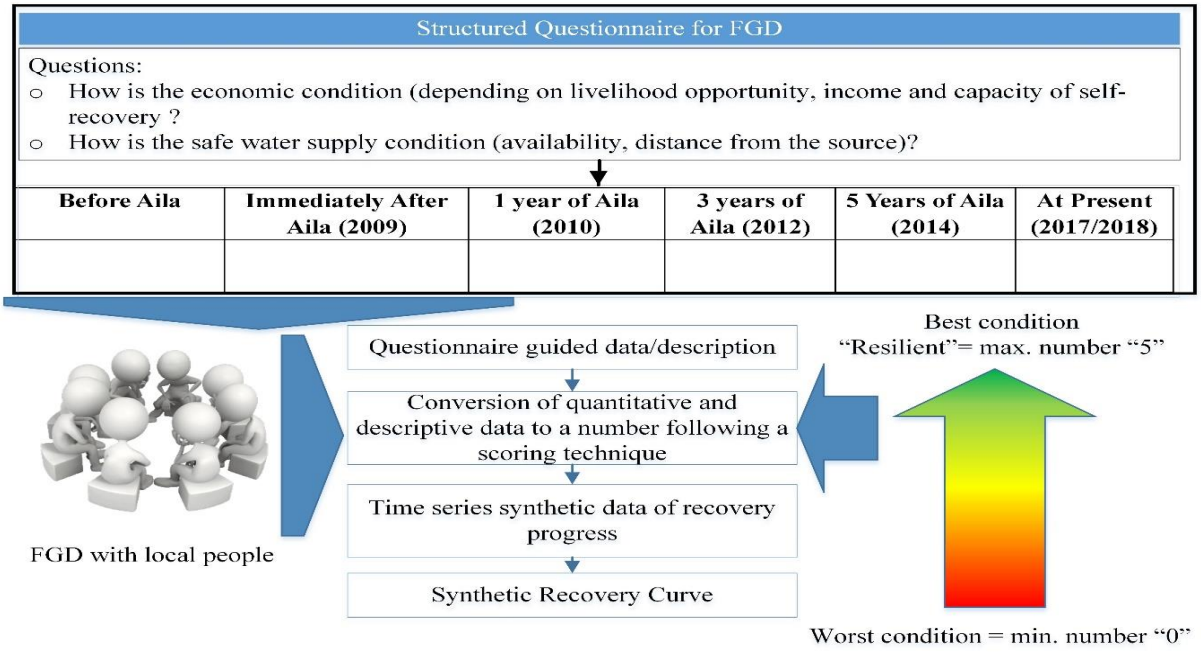

Fig. 2 Methodology for measuring recovery progress

To facilitate answering the question about a sectoral condition, numerical scale ranging from minimum number "0" to maximum "5" with description was introduced to them. Scoring scale adopted for assessing economic recovery and coastal polder are presented in Table 1 and. 2

Table 1: Scoring technique for quantifying local economic condition

Scenario of economic condition	Corresponding score (number)
Resilient economy (best condition): • Diversified, sustained, and certain livelihood opportunity • Very efficient safety net programs to ensure no population living below the poverty line • >80% has strong economic condition to deal with future Aila similar cyclone • Even a future Aila similar disaster would suspend livelihood activities, it would promptly resume • Income activities are insured to recover disaster damage	5
Good economic condition: • >60% has strong economic condition to deal with future Aila similar cyclone • Livelihood opportunity is diversified. • If livelihood activities are suspended by a disaster like Aila, it would resume within a short period • A safety net is available to promote post-disaster recovery	4
Moderate economic condition: • 40% has economic condition to deal with future Aila similar cyclone • There is a safety net for people living in poverty • In post disaster situation, people can survive without aid but cannot enable self-recovery	3
Low economic condition/struggling: • Only 20% has economic condition to deal with disaster • 80% People can just meet up the daily needs • Income opportunity is little diversified • Social safety nets are insufficient • At the time of disaster humanitarian aid would be mandatory	2
Poor economic condition/living in poverty: • Despite hard working it is very difficult to meet up daily needs • In a certain time of a year, it is impossible to meet up daily needs • Livelihood opportunities are very limited • At the time of disaster, emergency humanitarian aid is mandatory to survive	1
Living in emergency/retreat (worst condition): • Population is living in emergency humanitarian aid • All livelihood activities has been suspended	0

Note: this scale with corresponding economic scenarios were preliminary developed by FGDs.

(1) Measuring recovery of local economic condition

Since this is a perception-based study, we tried to explain the notion -"local economic condition" to the local people as their overall perception on local economy depending on their livelihood opportunity, employment opportunity, and self-recovery capacity after a future similar disaster. Any established index-based method was not adopted deliberately to make the process easier. Rather, it was aimed to know their cognitive response out their local economic condition. While giving their response, participant were considering livelihood opportunity, employment opportunity, income uncertainty, and capacity of self-recovering from a Aila similar disaster. Thus their self-evaluation of their economic condition would also reflect their awareness on economic preparedness for a future disaster.

During the FGD, the translated Bangla version of the descriptive scale (Table 1) was introduced to the participants to facilitate the discussion. As the discussion evolved, people came to an agreement to define prevailing economic condition corresponding to different years. Finally, the number corresponding to their given descriptive economic condition was decided during FGD.

(2) Measuring recovery of coastal polder

Condition of coastal polder was defined as its functioning ability to serve its purpose. During the FGD a scale to guide quantification (Table 2) was introduced to the participants. Similar to measuring local economic condition, participants gave descriptive data and their overall perception thereof on condition of coastal polder. The scale to quantify the condition ranges from "resilient coastal polder (corresponding score is the maximum number 5)" to "not functioning (corresponding score is the minimum number 0".

Table 2: Scoring technique for quantifying condition of coastal polder

Scenario of economic condition	Corresponding score (number)
Coastal polder to prevent Aila similar disaster: • It is proven to be effective during spring tide in monsoon • It has been planned considering land regulation and land use plans • The height of the embankment is above the surge level of Aila • There was no breaching of embankment since it had been reconstructed • Effective monitoring and maintenance plan to ensure reliable function	5
Improved coastal polder to prevent tidal flood • The embankment has been recovered with new design • It can prevent tidal flooding • However, it will be overtopped during a cyclone event like Aila • Effective monitoring and maintenance plan to ensure reliable function • Practice of illegal breaching has been resolved	4
Moderate condition • The polder was restored to pre-disaster design condition • It can prevent regular tidal floods • No breaching of embankment at present • However, there is no monitoring system to prevent illegal breaching • At some places it becomes weak which could be breached during monsoon	3
Weak condition • It can prevent regular tidal flood • Spring tide breaches and overtops the embankment several places • At present, it is open at several places • Eroding river banks at several places	2
Very weak condition • It fails to protect the village from flooding from regular tide • Embankment breaching is very frequent • Embankment is open at several places • Eroding river bank at several places	1
Not functioning • The embankment is washed away • Out of order	0

Note: this scale with corresponding economic scenarios were preliminary developed by FGDs.

3.4 Construction of synthetic recovery curve to illustrate recovery progress

Following the scoring technique of quantifying prevailing sectoral conditions, FGDs allowed to construct time series data of prevailing conditions of different sectors from at the time of Aila hit to present. Quantification of the condition of different sectors in different years within recovery period illustrates the progress of recovery. Thus people's perceptions allowed to construct a synthetic data to measure the progress of recovery as it evolved.

From the time series data of recovery progress, synthetic recovery curves were constructed for different sectors. A synthetic recovery curve illustrates recovery progress dated from 2009 to 2017/18. Similar approach of using people's perception in quantitative analysis can be found in vulnerability assessment (Dutta et al. 2011; Dutta et al. 2013). In a recent joint research, academicians in Australia and Japan tried to analyze the impact of sea level rise, to prioritize flood impact issues and to analyze impact of adaptation measures considering a similar approach of quantitative analysis from people's perceptions (Dutta et al. 2013). Similar approach of quantitative assessment using perception can also be found in resilience assessment (Sadik and Rahman 2010; Parvin and Shaw 2011). In a study on resilience assessment of Dhaka city, authors interviewed officials of different institutions to obtain resilience score of different resilience indicators and finally assessed resilience of the city (Parvin and Shaw 2011).

4 Cyclone Aila Recovery in Koyra

4.1 Progress of Economic Recovery

Local economy in Koyra was predominantly an agricultural economy. Shrimp farming and its related businesses, and rice cultivation were dominating economic activities. Koyra upazila was categorized as an "very hard-to-reach area" due to high poverty, and poor condition of water supply and sanitation

(Ahmed and Hassan 2012). Which was somewhat reflected in the focus group discussions.

The synthetic recovery curve constructed to illustrate the economic recovery is shown in Fig. 3. The union average of "economic conditions before Aila" of four unions vary from 2.21 to 2.65 which correspond to in between low and moderate economic condition. Cyclone Aila caused drop of the economic condition below the threshold of "poor condition". The worst condition, "0" corresponding to "living in emergency" reached in case of Dakshin Bedkashi. Dakshin Bedkashi was entirely inundated by storm surge. That inundation continue for almost 3 years due to delaying in rehabilitation of coastal polders. Among the four unions, condition was little bit less severe in case of Uttar Bedkashi. After one year of Aila, the economic condition slightly improved towards the margin of "low economic condition" due to delivery of emergency aid by the government and international humanitarian organizations. However, the score remained below "1". The little trend of recovery appeared due to intervention of NGOs and Government. Aila suspended all agricultural activities due to flooding to the entire upazila. People could not resumed the activities until the coastal polder had been rehabilitated in 2012-2013. During that period, people adopted several strategies to survive which included migration to other places for seeking income opportunity, switching of livelihood, and living with humanitarian aid. Rice farmers opted fishing and fish culture as a recovery strategy. Agricultural labor opted to work as day labor in re-construction works. UNDP launched a special one year program of "cash for work and cash for training" under the umbrella of the Early recovery facility project of multi-donor fund (UNDP 2011; Sadik, Nakagawa, Shaw, et al. 2017). Under that program, local people could work in reconstruction of roads, housing or other infrastructures as a day labor. In rest six months, when construction activities are not possible due to monsoon rain, local people could earn by attending in different training programs related to livelihood and disaster preparedness. All of these kind of programs were continued from 2012 to 2014. However, it was in 2014 when local people could resumed their agricultural activities which resulted significant improvement of their economic condition. Fig. 3 shows that in 2014 the economic condition reached to a level somewhat better that pre-Aila condition. After 2014, the trend of developing economic condition became very mild.

Fig. 3 Synthetic recovery curve of local economic condition

The present economic condition is "moderate". Locals were claiming that around 40% people may not need emergency aid if a similar disaster strike again. However, they also informed that almost none have capacity of self-recover their economic condition if a similar disaster strike again.

The synthetic recovery curve shows that there is a distinct improvement of economic condition in-terms of increasing income opportunity and certainty. Their income opportunity is more diversified that before. Breaking the traditional trend, now farmers sometime work as a day labor or earn money by fishing or driving a three wheeled van (a common public transport in rural areas of Bangladesh). How much these changes are contributing in reduction of their pre-existing vulnerability is unknown. Pre-existing economic vulnerability included unsustainable agricultural practices, unsustainable shrimp framing, growth of shrimp farming in paddy suitable areas, high dependency on nature, etc. (Sadik, Nakagawa, Rahman, et al. 2017; Sadik et al. 2018). These vulnerabilities still prevails. Our previous study on measuring inclusiveness of pre-Aila vulnerability reduction (PAVR) measures in

recovery found that the economic recovery in Koyra was poorly inclusive to PAVR. The synthetic recovery curve of economic condition (Fig.3) illustrates similarly that the economic condition appears to be little better than before-Aila but still a far away from the resilient economy (see Table 1).

4.2 Recovery of coastal polder condition

Koyra upazila was protected by two polders – polder 13-14/2 and 14/1 (Fi.g 1) which were constructed in 1967–late 1970 to protect agricultural land (mostly rice) from flooding due to high tide (Shah Alam Khan 2008). With the trend of developing shrimp aquaculture in the country after 1980s (Akber et al. 2017), rice fields had been gradually converted to saline water shrimp aquaculture ponds. In absence of effective maintenance and monitoring system for coastal polders, shrimp farmer started installing illegal pipes beneath the embankment to irrigate their shrimp ponds with saline water from river. No major maintenance work since the construction of those polders, development of river bank erosion, illegal activities on embankment (construction of housing, livestock shelter, unplanned tree plantation, etc.) and illegal breaching had weakened the embankment. Before cyclone Aila, the condition of coastal polder was weak. Therefore, when storm surge struck the coast, embankment was breached at 34 places and overtopped as well.

After one year, Bangladesh Water Development Board (BWDB) could commenced emergency repair of the embankment only at few places which gave a little sign of recovery (Fig. 4). Afterwards, BWDB attempted urgent recovery of polder. Except at few places, BWDB could restored the polder 13-14/2 to its previous design condition. But restoration of polder 14/1 delayed. It was 2013-14 when it was possible to commenced urgent restoration of polder 14/1. These urgent restoration works was not event effective in preventing illegal breaching and erosion of river banks. Since the maintenance strategy and plans of polders were not revised, those earthen embankment started weakening. Therefore, the present condition of the earthen embankment is even worse than before Aila.

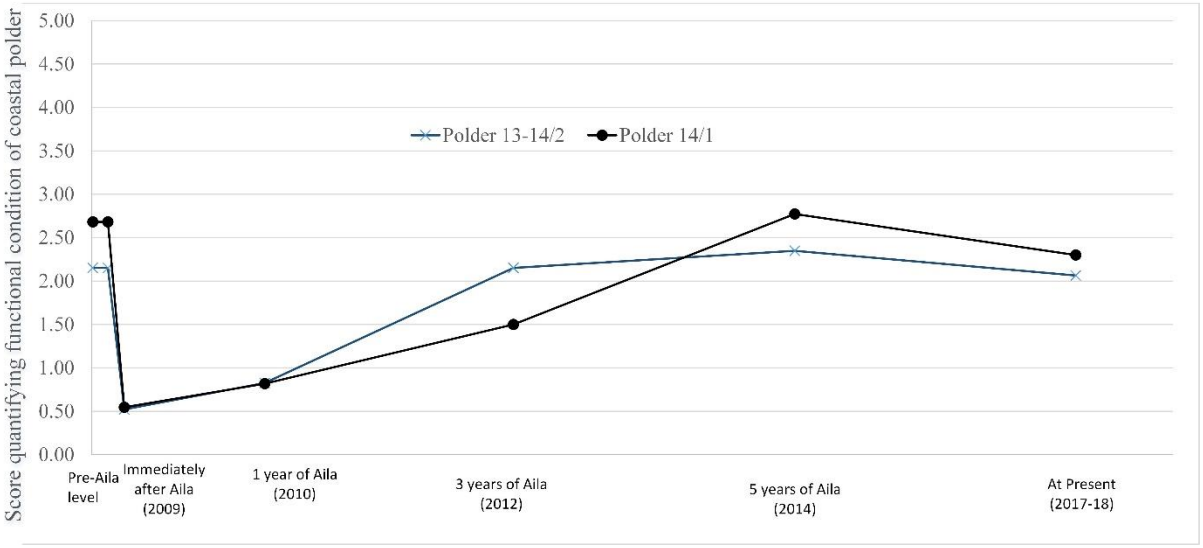

Fig. 4: Synthetic recovery curve of coastal polder

5 Concluding Remarks

The results show that local economy has been restored to a level better than earlier. However, the new level is a moderate condition where pre-Aila vulnerabilities still exist. On the other hand, the full-fledge recovery of coastal polder has not been commenced yet. As a short-term measure, urgent recovery work has been commenced to restore the polder to its pre-disaster condition as best as possible. Since that work did not considered any effective measures for pre-Aila vulnerabilities e.g. growth of saline of shrimp farming, illegal breaching of polder, ineffective maintenance plan, absence of monitoring system and no land use plan at place (Sadik et al. 2018), the condition of polder weakened again. The present condition of the polder is worse than before Aila. Continuing tidal flooding due to embankment breaching undermines the success of recovery of other sectors.

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