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SUCCESSFUL CLIMATE ADAPTATION

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The underlying study for this summary report has been carried out by the International Centre for Ethnic Studies (ICES) in 2014 on behalf of Diakonia. Main authors of the underlying study are Kasun Pathiraja, Madhawan Balaraman and Shanthi de Silva.

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Summary

This summary report is based on a study by ICES¹, commissioned by Diakonia. In this summary report we look at three successful projects of climate change adaptation in Sri Lanka.

Sri Lanka is an island situated off the Southern tip of India. Temperature-related extreme events have increased over most locations in the country. Annual average rainfall over Sri Lanka has been decreasing for the last 57 years at a rate of about 7 mm per year. Agricultural activities are already affected by climate change impacts on water resources.

Climate change in Sri Lanka is expected to lead to a rise in sea level, higher temperatures, more frequent and prolonged droughts, high intensity rainfalls and increased thunder activity. Climate change impacts could include: inundations, flooding, storm damage, and coastal erosion affecting human settlements and wetlands; decreases in agricultural crop yields; pollution of waterways and wells, leading to increases in waterborne diseases; and increased soil erosion from heavy rainfall events. These anticipated changes represent a significant threat to the coastal areas, as well as to different sectors of the national economy and human health.

The case studies look at projects of climate change adaptation implemented in the fields of agriculture, water and infrastructure. The case studies cover projects located in the areas vulnerable to climate change and bring up how people have been affected – through their own narratives. The case studies also assess how the implemented projects have benefited people and reduced vulnerability, and finally they identify areas where replications are required.

The agriculture project is about introducing alternative ways of paddy cultivation to survive in the conditions of decreasing water levels. This includes promoting dry soil sowing of paddy as an economic way of agriculture water use and introduction of traditional varieties of paddy which can withstand water shortages and increasing air temperature.

The water project is about construction of salt water exclusion bunds (walls) in the coastal areas, where invasion of salt/brackish water by the sea and the lagoons is a major problem. It causes salinification of the agricultural lands and the groundwater; affects the settlements of the coastal communities causing displacements, losing their livelihood and causing damages to the properties.

The infrastructure project is about preventing disastrous effects of landslides by installation of landslide sensors to strengthen the warning system and assisting people in designing their buildings and infrastructure by providing engineering consultations.

Conclusions in this summary report include how the people in Sri Lanka are already feeling the impacts of climate change, and therefore the immediate need to adapt to the effects of climate change. The ideas, knowledge and capacity exist in the country, but are not widespread. Most importantly, the money needed to move to implementation is missing.

The projects in this summary report came about because there was some funding available from sources other than proper climate finance. If funds in the form of new and additional climate finance are made available, instant replication of successful adaptation measures could take place, benefitting many more people in Sri Lanka.

Looking beyond the studied areas in Sri Lanka, it's easy to see the similar situations and needs in other – bigger – parts of the world, including neighboring India, Africa and Latin America.

As a side effect, this summary report clearly shows the interlinkages between general development assistance and supporting climate change affected people and countries. This means the work should be done in tandem, but additional funds need to be provided.

The recommendations in this summary report are:

- » Developed countries need to *provide new and additional climate finance*, at a minimum at the levels of the \$100 billion stated in the Copenhagen Accord.² See Diakonia calculations for country shares.^{3, 4}
- » Climate finance should *strengthen existing development cooperation* (ODA), not build separate structures.
- » Climate finance needs to be *accessible* to the people who need it.
- » Needs and measures of climate change adaptation are known well enough to *not delay action*, but there's still a need for further research and mapping. Such research and mapping need climate finance.

¹ STUDY OF CLIMATE CHANGE ADAPTATION MEASURES LACKING FUNDING IN SRI LANKA, DIAKONIA 2014

² [HTTP://UNFCCC.INT/RESOURCE/DOCS/2009/COP15/ENG/L07.PDF](http://unfccc.int/resource/docs/2009/cop15/eng/l07.pdf)

³ [HTTP://WWW.DIAKONIA.SE/GLOBALASSETS/DOCUMENTS/DIAKONIA/CAMPAIGNS/SPRINGNOTAN-2013/EU-SHARES-OF-INTERNATIONAL-CLIMATE-FINANCE.PDF](http://www.diakonia.se/globalassets/documents/diakonia/campaigns/springnotan-2013/eu-shares-of-international-climate-finance.pdf)

⁴ [HTTP://WWW.DIAKONIA.SE/GLOBALASSETS/DOCUMENTS/DIAKONIA/CAMPAIGNS/SPRINGNOTAN-2013/SVERIGES-ANDEL-AV-INTERNATIONELL-KLIMATFINANSIERING-2.PDF](http://www.diakonia.se/globalassets/documents/diakonia/campaigns/springnotan-2013/sveriges-andel-av-internationell-klimatfinansiering-2.pdf)



LAZARUS THAMEL IS A FARMER IN THABBOVA. OVER THE LAST YEARS HE HAS OBSERVED UNPREDICTABLE RAINFALL AND AN INCREASED WATER SHORTAGE.

Introduction

Sri Lanka is an island situated off the Southern tip of India. More than 20 million people⁵ live on an island the size of Latvia (which has 2.3 million people). The GDP per capita is USD 2,923⁶.

The three main sectors of the country's economy are services 59%, industry 30% and agriculture 11%. However, agriculture is the sector that provides the highest percentage of employment and livelihood opportunities to the Sri Lankan labor force. 33% of the labor force is employed in the agriculture sector. Agriculture is done in almost all the regions in the country. Tea and rubber are mainly grown in wet zones (southwestern region including central hill country) and paddy and coconuts are cultivated in intermediate and dry zones (northern and eastern parts of the country). The dry zone agriculture is mainly determined by seasonal rainfalls and the irrigation systems.

Climate change, driven by the rising concentrations of greenhouse gases in the Earth's atmosphere, is causing changes to many ecosystems of the world. Temperature and precipitation are the most important climatic parameters that have the highest impacts on human life.

During the Southwest monsoon period (May to September) in Sri Lanka the overall increase in mean annual air temperature across the island is predicted to increase by 1.2°C - 1.6°C⁷. Temperature-related extreme events have increased over most locations. Further the Northeast monsoon rainfall is predicted to decrease in dry zones of the country. Annual average rainfall over Sri Lanka has been decreasing for the last 57 years at a rate of about 7 mm per year. The decreased rainfall and increase in temperature is increasing the evapotranspiration and soil moisture deficits. Agricultural activities in the dry zone are already affected by climate change impacts on water resources.

Human-induced climate change has emerged as a major concern of our times. Having initially emerged as an environmental issue, it is now regarded globally as an overarching development challenge that can seriously affect economic growth, food security, public health, and social stability. Developing countries are especially vulnerable.⁸

A report from Oxfam states: "Being a developing island nation subject to tropical climate patterns, Sri Lanka is highly vulnerable to climate change impacts. Extreme weather events such as high

intensity rainfall followed by flash floods and landslides, and extended dry periods resulting in water scarcity are now becoming common occurrences in Sri Lanka. Any adverse changes in already volatile weather patterns are likely to impact adversely on the socio-economic activities in the country".⁹

"Climate change in Sri Lanka is expected to lead to a rise in sea level, higher temperatures, more frequent and prolonged droughts, high intensity rainfalls and increased thunder activity. Climate change impacts could include: inundations, flooding, storm damage, and coastal erosion affecting human settlements and wetlands; decreases in agricultural crop yields; pollution of waterways and wells, leading to increases in waterborne diseases; and increased soil erosion from heavy rainfall events. These anticipated changes represent a significant threat to the coastal areas, as well as to different sectors of the national economy and human health."¹⁰

About this report

Although Sri Lanka has been identified highly vulnerable to climate change, few adequate interventions to mitigate or to adapt to adverse impacts of climate change have been made so far. Although many studies have been done to grasp the impact of climate change, no serious studies have been implemented to understand the reasons for above inadequacies. Holding the assumption that climate change funding is one of such causes, this summary report is an effort to identify such gaps and to recommend what has to be done to reduce climate change vulnerability of the country. This report looks at climate change adaptation policies and measures implemented so far in the country. Based on already implemented projects, the study tries to identify areas where adaptation interventions are immediately required, the resources they are lacking and their funding needs in particular.

Successful Climate Adaptation

The case studies in this summary report look at projects of climate change adaptation implemented in the fields of agriculture, water and infrastructure. This is an effort at understanding the level of change such projects have made in rights holders perspective and to identify most crucial areas of future intervention. The case studies cover projects located in the areas vulnerable to climate change and bring up how people have been affected – through their own narratives. The case studies also assess how the implemented projects have benefited people and reduced vulnerability, and finally they identify areas where replications are required.

⁵ [HTTP://WWW.CBSL.GOV.LK/PICS_N_DOCS/10_PUB/_DOCS/STATISTICS/OTHER/ECON_&_SS_2013_E.PDF](http://www.cbsl.gov.lk/pics_n_docs/10_PUB/_DOCS/STATISTICS/OTHER/ECON_&_SS_2013_E.PDF)

⁶ CENTRAL BANK DATA 2012

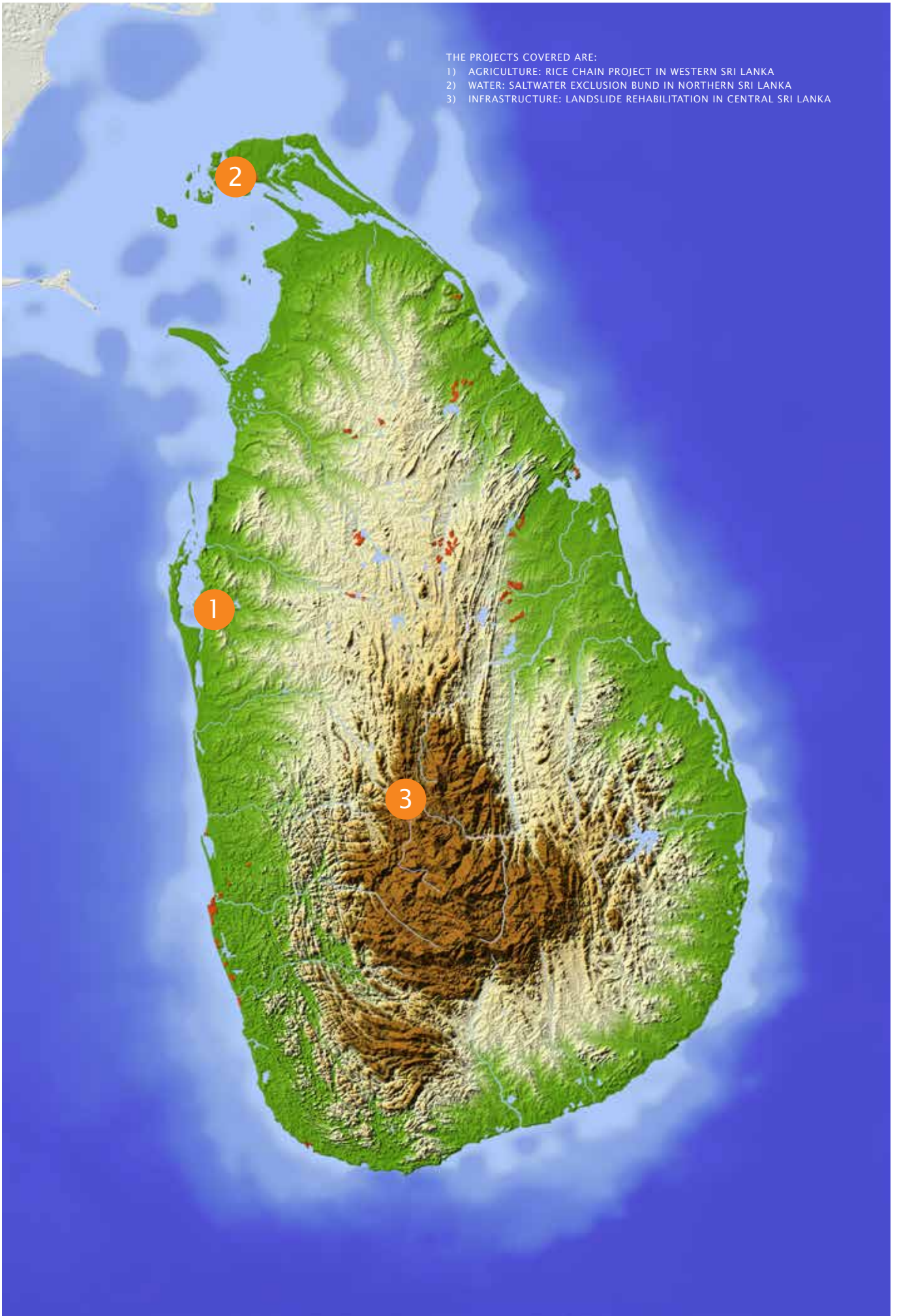
⁷ DE SILVA, 2006: [HTTP://WEDC.LBORO.AC.UK/RESOURCES/CONFERENCE/32/DESILVA.PDF](http://wedc.lboro.ac.uk/resources/conference/32/desilva.pdf)

⁸ JAYATHUNGA 2011: [HTTPS://GOOGLEGROUPS.COM/GROUP/CLIMATE-CHANGE-2011/ATTACH/7943668269574671/FINAL%20IPW%20REPORT.PDF?PART=6](https://googlegroups.com/group/climate-change-2011/attach/7943668269574671/final%20IPW%20REPORT.PDF?part=6)

⁹ UN HABITAT [HTTP://WWW.UNHABITAT.LK/DOWNLOADS/CLIMATE_CHANGE_POLICY.PDF](http://www.unhabitat.lk/downloads/climate_change_policy.pdf)

¹⁰ REVIEW OF CLIMATE CHANGE ADAPTATION PRACTICES IN SOUTH ASIA [HTTP://WWW.OXFAM.ORG/SITES/WWW.OXFAM.ORG/FILES/RR-CLIMATE-CHANGE-ADAPTATION-SOUTH-ASIA-161111-EN.PDF](http://www.oxfam.org/sites/www.oxfam.org/files/rr-climate-change-adaptation-south-asia-161111-en.pdf)

THE PROJECTS COVERED ARE:
1) AGRICULTURE: RICE CHAIN PROJECT IN WESTERN SRI LANKA
2) WATER: SALTWATER EXCLUSION BUND IN NORTHERN SRI LANKA
3) INFRASTRUCTURE: LANDSLIDE REHABILITATION IN CENTRAL SRI LANKA





W. NIKULAS, A FARMER IN PUTTALAM SHARED HIS EXPERIENCE WITH US:

“For more than twenty years, I have been writing down the weather conditions and rainfall data almost every day in my diaries. When looked at those raw data itself, we can realize how the rainfall has been gradually decreasing in our area. Moreover, the temperature has also been significantly increasing. For example, according to my estimates, during the dry seasons, hot winds may evaporate more than 25mm of water every day from the common water tank. We used to have small irrigation systems around big tanks in the past to control evaporation from the big tanks, but due to development projects, now they are no more there. With the help of the common water tank, about 400 farmers could cultivate paddy in the past in both seasons. But, now, due to frequent droughts and less rainfall, we have been able to cultivate only in one season. Even during that season farmers have to undergo lots of competitions channeling water to their fields. So far about 100 farmers have been fully affected and have given up paddy cultivation”.



AGRICULTURE:

Rice Chain Project in Western Sri Lanka

This case study was done in order to capture the adaptation measures farmers implement to cope with temperature and water scarcity.

Puttalam district is situated in the Northwestern province of Sri Lanka. According to the climate classifications it belongs to the dry zone of the country. Sharing the coastal line of the country along the western parts, Puttalam has been identified as one of the highest vulnerable districts in Sri Lanka in terms of rising sea levels and declining fresh water resources. The main livelihood of the people in this district is agriculture. Fishery also accounts for a significant number of employments.

Scattered small irrigation tanks and a few water streams running from catchment areas of large scale irrigation projects are the main water sources of agriculture. Due to the decreasing annual rainfall, agriculture is highly dependent on these irrigation systems. Large scale irrigation system that feed many of the small irrigation canals flow from the North Central province that belongs to the dry zone where water is used for intensive agriculture. In such a setup, water

resource in Puttalam district has a high dependency on the weather of the adjoining districts and whatever small amount of rainfall the district receives.

Total annual rainfall distribution for 1962-2009 has shown a decrease in Puttalam district. The maximum temperature of Puttalam district has increased ¹¹. According to agriculture research, there is a negative correlation between the air temperature and paddy rice yield.

An organization called Practical Action has been implementing the “Rice Chain” project in Puttalam district. The target group is about 300 paddy farmers whose cultivation is dependent on rainfall and a common water tank. Traditionally, farmers have been doing paddy cultivation twice a year. However, due to decreasing rainfall and droughts over the years, this pattern has changed and in some years they have been compelled to do farming only in one season. This has caused both monetary and social losses for the farmers whose main income source is paddy farming.

¹¹ [HTTP://OAR.ICRISAT.ORG/6545/1/POLICY%20BRIEF%202020.PDF](http://oar.icrisat.org/6545/1/POLICY%20BRIEF%202020.PDF)

The Rice Chain project has three main components:

1. Introducing alternative ways of paddy cultivation to survive in the conditions of decreasing water levels.

This includes promoting dry soil sowing of paddy as an economic way of agriculture water use and introduction of traditional varieties of paddy which can withstand water shortages and increasing air temperature. Further, with the water saved through these methods, they also promote cultivation of short-term crops like yams in between two seasons.



PADDY FIELDS IN PUTTALAM DISTRICT: ON THE LEFT SIDE OF THE ROAD ARE THE FIELDS WHICH USED DRY SOIL SOWING TECHNIQUE. DUE TO THIS, HARVESTING HAS ALREADY BEEN DONE IN THESE FIELDS. ON THE RIGHT SIDE OF THE ROAD ARE THE FIELDS WHICH HAVE NOT FOLLOWED THE ABOVE METHODS AND ARE STILL WAITING TO HARVEST WHILE THE WATER LEVELS ARE GOING DOWN.

2. Introducing alternative livelihood opportunities for traditional farmers to reduce their dependency of vulnerable paddy farming.

In this project 70 farmers have given training and capital to start poultry farms in this area. To make sure the availability of a good market for the poultry products they produce, the farming is done organically using the resources available in the area, as organic food has a better market demand than other products.

3. Linking the new livelihood activities of the farmers with the big market chains in the capital (Colombo).


This is a way to ensure the sustainability of these activities. Through these, farmers and farmer societies are directly linked with well-established companies as long-term buyers of these farmers' products.

Project Implementer's Perceptions:

WARUNA, THE PROJECT MANAGER OF RICE CHAIN PROJECT, SHARED HIS EXPERIENCES WITH US:

“This is an area where lands were distributed by the government more than 60 years back to the poor people in the area to improve their livelihood by using uncultivated lands for agriculture. The whole project consists of more than 500 acres of land. Paddy cultivation has been the sole livelihood support system of more than 400 families. Due to the long-term droughts and high temperature, water has been becoming scarce every day. This has destroyed many cultivations as the irrigation water is not adequate. Many people are now giving up paddy cultivation and looking for manual jobs in the cities. Moreover, the water scarcity and damages to agriculture had resulted in severe poverty levels among the communities. As a consequence, you will find that almost all the families have at least one member working abroad, mainly in Middle-East countries. More than 60% of them are women. This has created a vicious cycle of poverty in this area. When the women are not in the house, whole family institution breaks up and it affect the education of children and thereby the future economy as well. Due to high numbers of migrant workers travelling back and forth, this area is highly affected by HIV Aids. I see the spread of it very fast although it has not yet been identified as an issue by the health officials.”

Under the first component of the project, already 200 acres of paddy fields have been introduced with the dry soil sowing technique. Farmers who have practiced this have been able to use minimum amount of water and have collected the harvest more than one month in advance compared to sowing according to traditional seasons. According to the project manager Waruna, the biggest problem created by climate change is the difficulty to predict the rainfall. The patterns have all changed. There has not been any advanced system to scientifically make accurate rain forecasts and to communicate them to the farmers to make maximum use of the rain. Due to this gap, farmers cultivate based on their own inaccurate predictions. In such a situation, sowing in dry soil before the expected rainy seasons has been a relatively better adaptation method than sowing after the rain because by the time of rain, the plants are bigger and within a short time they can be harvested. Savings of the water and time with this system have been invested in cultivating short-term crops. Farmers who have not yet followed this system are now planning to use it in the next season.

A portrait of Letti Brijet, an elderly woman with grey hair, wearing a blue and white patterned shirt. She is looking directly at the camera with a neutral expression. The background is a blurred outdoor setting with trees and foliage.

LETTI BRIJET NOW ONLY GETS ONE HARVEST PER YEAR, COMPARED TO THE TWO HARVESTS SHE USED TO GET. THIS IS BECAUSE OF THE UNPREDICTABLE RAINFALL AND INCREASED WATER SHORTAGE.

Funds Needed for Replications and Identified New Projects:

Following are the Rice Chain Project costs to serve 100 families (300 farmers) who have been using about 500 acres of paddy land.

Component 1- Introducing new techniques of farming and new varieties		
Activity	Number of beneficiaries (farmers)	Cost (EUR)
Training and advocacy	300	2,964
Seeds	300	5,928
One tractor for the area to be managed by the farmers society	300	11,856
Communication for updating on rainfalls based on data from meteorological department	300	1,186
Total Cost		21,933

Component 2- Alternative livelihood programs		
Training on poultry farming	100 families	5,928
Equipment or initial capital	100 families	88,917
Total Cost		94,845

Component 3- Connecting with Market chains		
Marketing training	100 families	2,964
Connecting meetings	100 families	2,964
Total Cost		5,928

Thus, the total budgeted cost of Rice Chain Project that benefits 100 families (300 paddy farmers) in the area is **EUR 122,706**.

Regarding the possibility of replicating this project, the Practical Action spokesperson emphasized the importance of immediately replicating this type of a project targeting 100 families in Kalpitiya in the same district. He also identified two areas in Hambantota and two areas in Mannar district. Each district consists of 200 families. Therefore, if project of this kind is replicated in five areas catering 500 families, the total estimated cost would be approximately **EUR 613,526**.

However, proper feasibility analyses have to be done before implementing such projects due to the area specific socio-economic dynamics. Such a replication process is supposed to improve lives of 2,000 people directly and about 7,000 people indirectly as an adaptation measure to climate change.



WATER:

Saltwater Exclusion Bunds in Northern Sri Lanka

The project described covers the infrastructure facilities developed to adapt to climate change related water issues. The study was done in Jaffna district as it was identified as the most-affected in terms of climate change driven water issues in the country. The project was funded and implemented by the International Organization for Migration (IOM), the Department of Agrarian Services and the Department of Irrigation in Delft Island.

Invasion of salt/brackish water by the sea and the lagoons is a major problem in Jaffna peninsula and nearby islands. It causes salinification of the agricultural lands and the groundwater; affects the settlements of the coastal communities causing displacements, losing their livelihood and causing damages to the properties.

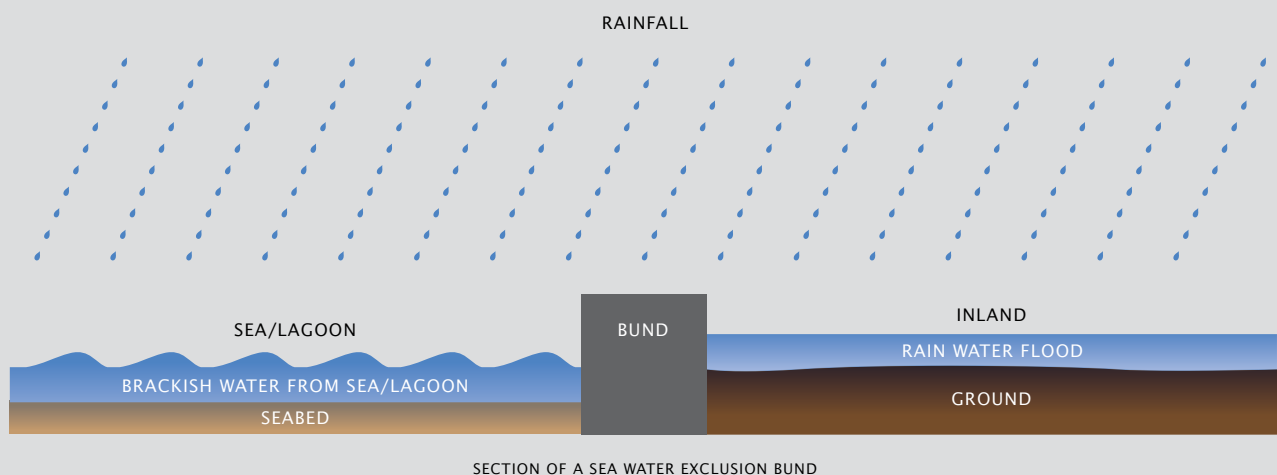
Farmers, fishing communities and the general population are the most vulnerable to sea water invasion. Farmers lose their farmlands

and grazing lands for cattle, fishermen of fresh water sources lose their fishing shores and settlements and the increased salinity of fresh water wells affect the general public in terms of drinking water.

According to the Divisional Secretary of Delft, Mr. Alvappiali Siri, in the Delft Island, 21 sites for the construction of bunds have been identified and three are already constructed. Allocated project budget is EUR 183,109 and the project period is 2013 to 2014. The purpose of these bunds in Delft is to prevent the salinification of the only inland water source in the west coast – Sarapity wells and to prevent the coastal population from sea level rise during the tidal periods and to retain the rain water floods during the rainy season. This project was supposed to help more than 1,500 people living in the coastal areas who have been affected in terms of drinking water as well as agricultural water.

The only and long lasting system to overcome this crisis is the construction of Salt Water Exclusion Bunds (walls) in the affected coastal, areas. The purposes of the bunds are:

1. To prevent the intrusion of the sea/lagoon water into the inland
2. Retain the rain water flood in the inland as rain water conservation mention by functioning as a dam.



Project Implementer's Perceptions

ACCORDING TO MR. KARUNANITY, ENGINEER,
DEPARTMENT OF IRRIGATION, JAFFNA:

“Penetration of sea water in the agricultural and grazing lands of livestock is becoming a major problem in Jaffna district. It also affects the groundwater aquifer to become saline. Moreover, the major climate change issue is the drought, where the water is becoming more and more limited for drinking and agricultural purposes. The Jaffna population is dependent on the groundwater and the bunds have been built in 1970s under the Mahavali Project to prevent the penetration of sea water into the inland and to block the rain floods to run off to the sea as a measure of recharging the groundwater table. But during the war period the bunds have not been maintained and all of them were damaged and the sea water started to penetrate the inland. Many grazing lands were destroyed and agricultural lands turned into not suitable for the cultivation because of the solidification. Many fresh water wells in the most vulnerable areas have turned into salt water”.



THE RENOVATED BUND AT CHAVAKACHCHERI, THANNAKALAPU, JAFFNA, FUNDED BY AUSAID THROUGH IOM SRI LANKA.

THE SENIOR TECHNICAL OFFICER OF THE DEPARTMENT OF AGRARIAN SERVICES, JAFFNA, MR. SIVANANTHAN SAYS:

“The bund of Chavakachcheri-Thankilappu has existed almost for the last 60 years, but not as a continuous bund. This project was funded by AusAID IOM through the IOM Jaffna to rehabilitate the bund. The project commenced in July 2012 and completed in December 2012 at a budget of EUR 106,700. The bund had been damaged for constructing secure bunkers during the war period and adjoining paddy fields became more vulnerable with saline water. The total length of the bund is 7 km and 2 km have been newly constructed. We have observed that the soil structure is changing in the vulnerable paddy fields and it is becoming suitable for the cultivations. Also the grass in the grazing lands has started to grow after the renovation.

Perception of People from Delft Island

Due to the Tsunami in 2004 a bund at the Thaliaturai Fishing Shore was completely damaged. Mr. Rajan, the president of the Fisheries Cooperative Union and Mr. Thavarasa another villager in Delft were interviewed about the bunds at Thaliaturai, the northern coast of Delft. They showed the damaged bund which extended to 3 km. The structure was built from concrete and it was preventing the entry of sea water to the settlements during the tidal seasons in November to February.

“Now the sea water enters the settlements and many people have moved away from their homes during the high tidal season. The fishermen lost almost EUR 90,000 worth of fishing gears and boats due to the high tides in 2013. Fishermen can't go for fishing in the tidal season and are losing their livelihood. We put the request many times to the Government Authorities but it is not done and not in the development plan”.



THE BROKEN BUND AT THALAITHURAI, DELFT.

Perception of People from Chavakacheri-Thankilappu about the bund project



Mr. N. Senturan, owning a shop at the Thankilappu junction located about two kilometers from the renovated bund and his father K. Nantha Kumar and a villager Mr. K. Mahendran were interviewed at the Thankilappu junction. Their main livelihood is paddy farming, owning about 2 acres of paddy land. They said:

“The salt water wells have turned into drinkable water suddenly. Also we use the bund as a pathway to our paddy fields and to other villages after the renovation. Soil is always moist and we do home gardening for our food purposes. We do not face any serious problems for water. Earlier we had to go to a common fresh water well located about 1 km far from our village”.

LEFT TO RIGHT: MR. N. SENTURAN IS FATHER MR. K. NANDAKUMAR AND MR. K. MAHENDRAN WHO HAVE BEEN INTERVIEWED TO KNOW THE IMPACT OF THE RENOVATION OF THE BUND AT CHAVAKACHCHERI-THANKILAPPU, JAFFNA.

Funds Needed for Replications and Identified New Projects:

According to Mr. Karunanithi, the engineer of the Department of Irrigation Jaffna, the bund projects taken under the Department of Irrigation are only the rehabilitation of identified 34 existing bunds. Twenty two sites have been completed now and the other sites have to be completed by 2014. The Project is funded by the Asian Development Bank and World Bank through the Conflict Affected Regional Emergency Projects (CARE) under the Ministry of Economic Development. The implementation partner is Department of Irrigation, Northern Province. However, the project doesn't focus on improving the existing bunds because of the limitation of funding. Improvements are needed for the paving of the bunds and fixing rubber linings to the gates to seal the penetration of water. Approximate estimated cost for this activity is EUR 296,389. There is a shortage of EUR 177,834 for the ongoing rehabilitation work as well. If all the individual projects are implemented it will help to uplift the lives of more than 50,000 people directly and many more indirectly.

In Thalaiturai it is necessary to build a bund to prevent about 900 fishermen getting their lives, property and livelihoods damaged. Such a bund is not under the development plan because of the shortage of funds.

The Project Officer of IOM, Mr. Uthayakumar has mentioned that a lagoon area in the southern part of the Jaffna peninsula is highly affected by the sea water rise due to the tidal effects. More than 2,000 people in this area have been moving away because of the penetration of sea water into their settlements. Large area of farm lands, paddy fields and grazing lands are becoming saline because of this disaster. There is a need to build a new bund there but due to the lack of funds the project has not been implemented. However, UNDP and IOM are interested in funding a part of it. There are no estimations done yet for this project. However, an amount of EUR 326,029 is forecasted to be funded by a third donor (still not identified) to contribute to the initial estimations.

Shortages of Funds for the Rehabilitation and Improvements of the Existing Bunds in Jaffna

Activity /Description	Unit cost in LKR	Unit	Total units	Total cost in EUR
Improvements of the existing bunds	Lump sum			177,834
Rehabilitation costs	Lump sum			296,389
TOTAL				474,223

NOTE: The above estimations are in lump sum as per the information provided by the engineer of Department of Irrigation, Jaffna.

Estimation for 500 meters of Concrete Protection wall at Thalaiturai, Delft (No. of beneficiaries would be 900-1,200 people)

Activity /Description	Unit cost in LKR	Unit	Total units	Total cost in EUR
Excavation	2,500	Cubic Meter	1,000	14,820
Random rubble masonry work	36,500	Cubic Meter	2,000	432,728
Rubble packing to support the foundation	7,500	Cubic Meter	2,000	88,917
Engineering consultation 15%				80,470
TOTAL				616,934

Estimation for the Sea Water Extrusion Bund in Poonarin (No. of beneficiaries would be 2,000-3,000 people)

Activity /Description	Unit cost in LKR	Unit	Total units	Total cost in EUR
Building 5 km of SWE bund at Kumulamunai, Poonarin	Lump sum			326,028
TOTAL				326,028



INFRASTRUCTURE:

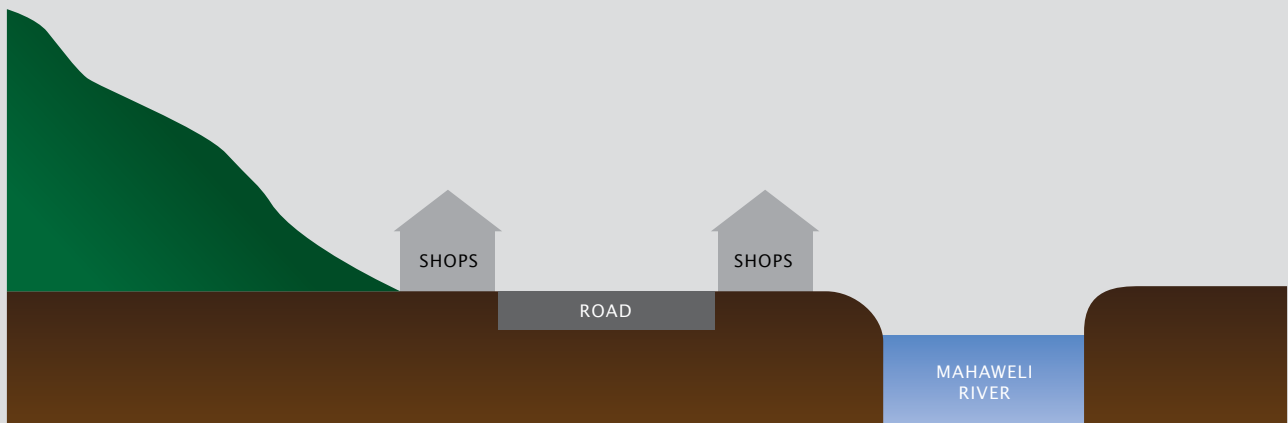
Landslide Rehabilitation in Central Sri Lanka

Infrastructure development is a cross cutting sector when it comes to adaptation measures. This section brings up two infrastructure development projects implemented in Kandy district on the issue of landslides which is a direct consequence of climate change in terms of unpredictable rainfall patterns and their high intensities. Landslides can create massive damages to properties, livelihood as well as threaten the lives of the people. Displacement caused by this can even have socio-psychological impacts. Recent studies have identified that due to the unpredictable changes and intensities of rain patterns and rainfall, no accurate mapping of vulnerable areas can be traced as was previously possible.

Peradeniya is located in the southern part of Kandy district. It is a mini-commercial town with almost 150 shops and 50 homes. Kandy is located in the central hills, falling in country's wet zone

and mid country intermediate zones. The climate records have shown increase of rainfalls in the wet zones of Sri Lanka while the rainfall is decreasing in the dry and intermediate zones. Rainfall during the rainy seasons have gradually increased in Kandy district in the past 10 years although in general the frequency and durations of the rainy seasons have come down with records of overall temperature of the district going up over the time.¹² This implies occurrence of short-term heavy rain falls which can cause heavy damage to the soil of the mountains.

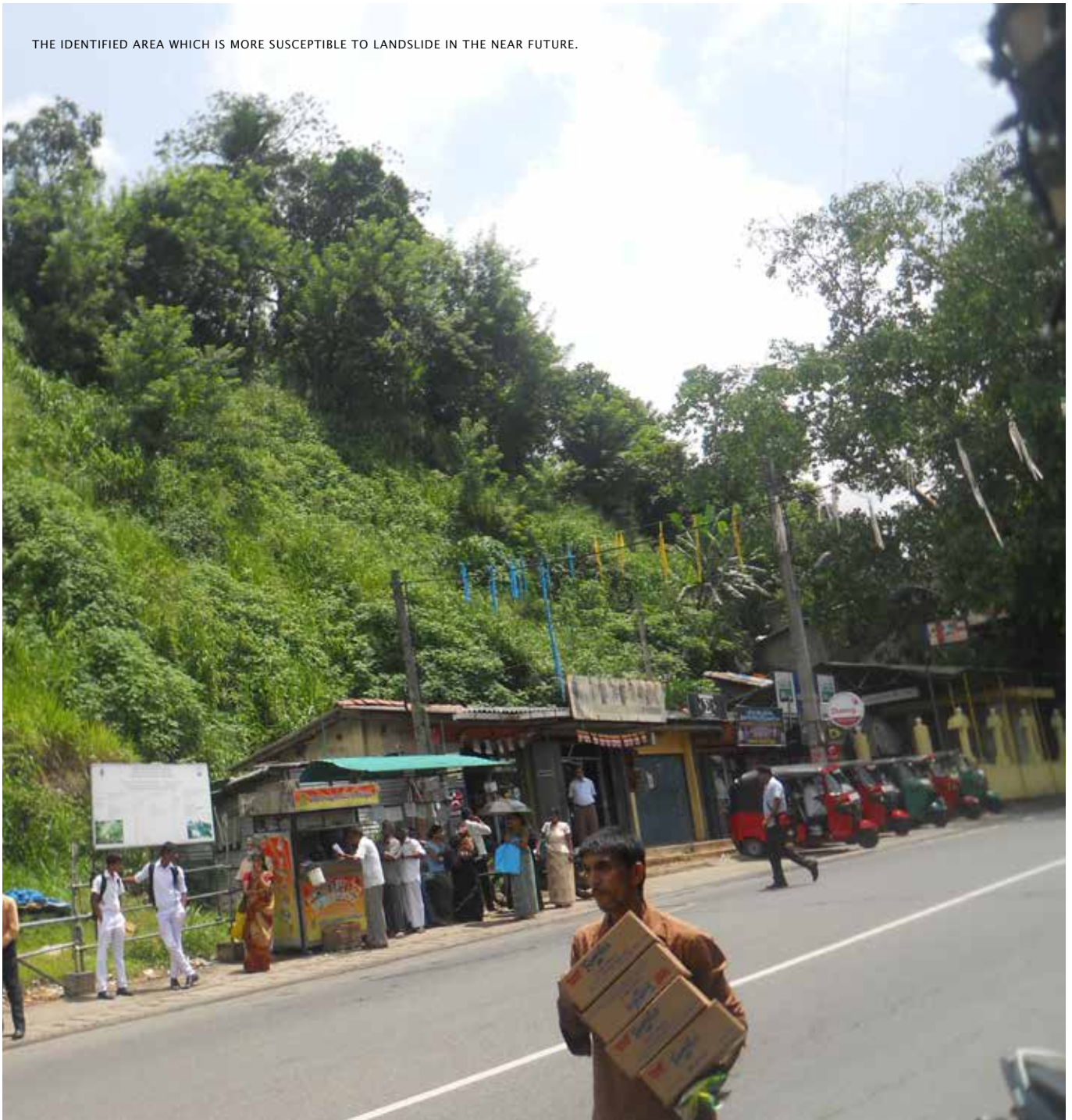
In November 2006 a landslide occurred in Peradeniya, where the hill on the left hand side was broken down to the road. Seven shops and almost 1 acre of land at the left side of the road were destroyed. No deaths or serious injuries were reported.



CROSS SECTION OF THE SITE OF THE LAND SLIDE OCCURRED AT THE PERADENIYA TOWN, KANDY

¹² TEA RESEARCH CENTRE OF SRI LANKA: WWW.TRI.LK/USERFILES/FILE/228%20E.../228%20E&E%20PROCEEDINGS.PDF

THE IDENTIFIED AREA WHICH IS MORE SUSCEPTIBLE TO LANDSLIDE IN THE NEAR FUTURE.



There are many causal factors for the occurrences of landslides in Sri Lanka. The major factors are:

- 1) The causal factors: the geological structure
- 2) Triggering factors: rainfall
- 3) Man-made factors: mining rocks, deforestation, construction of buildings not fall within the geological structure and in the most vulnerable areas for landslide, failure to manage the rain floods and drainages etc.

Project Implementers' Review

THE SENIOR RESEARCH SCIENTIST OF THE NATIONAL BUILDING RESEARCH ORGANIZATION OF SRI LANKA (NBOR), MR. NISHANTHA PERIES SHARED HIS EXPERIENCE WITH US:

“Due to the climate change in Sri Lanka, it is very difficult to predict the rainfall. Sometimes there are sudden rains and continuous rainfall which are not falling in line with the forecast done by the Department of Meteorology, Sri Lanka. The landslide happens with the rain, in the rainy season, when the soil of the slope/ steep parts of the hills gets moist and slides. Therefore, it is very difficult to predict the occurrences of landslides which is directly correlated to the rain falls. The occurrences of landslides are increasing. Now there are many cases all over the island with the unpredictable rainfall, and the man-made factors. Even though the government has provided lands for settlements and basic aid have been provided to shift their homes and business places, people tend to build buildings, homes and continue to live in the most vulnerable areas even after warning. This is because, they do not like to move away from their native homes and business places”.

Are there any automated warning systems for landslides?

“Yes. We have fixed sensors with warning sirens. The sensors will sense the earth movements and then provide signals to the sirens. The people who are living around will get the sound from the siren if there is a risk. Such system is fixed at Garandigala, Pussalawa (located in the hill country on the way to Nuwara Eliya).

What are the adaptation methods for landslides you implement?

“We maintain the proper slope of the affected areas or the most vulnerable areas which are highly hazardous. The locations closer to settlements, with the settlements, roads, highways, railway tracks and towns are the most hazardous areas. If a disaster happened like Peradeniya, we do the appropriate engineering to mitigate the disaster.

- » In Peradeniya the main engineering methodology we used is to maintain the proper slope of the hill in Sri Lanka: the angle is 39°. It is cut to three terrains as steps and proper drainages have been constructed.
- » Concrete retention walls and turfing with grass are the techniques we have adopted to avoid the landslide.
- » In some areas due to the rain, the groundwater table goes up and it loosens the bottom soil and triggers landslides. Here, we have dug deep wells and installed automated pumps to pump out the water when the water level arises.
- » We advise the people to maintain proper surface water drainage system to avoid seepage and water logging the in vulnerable area. Draining out the water will prevent the soil to get wet and the probability to slide is very low.

Have you fixed the sensors with sirens in all the areas?

“No. In the most vulnerable and hazardous areas only we have fixed. Due to the cost, we do not fix in all areas. A sensor will cost about EUR 1,482. We get the sensors designed and made from the Industrial Technological Institute of Sri Lanka”.¹³

What are the gaps in implementing the adaptation methods for landslides in Sri Lanka?

“There are not enough experts in the sector. Also the cost and the funds are limited. According to the government procedure, it is very complex to recruit new professionals for the landslide- related services. If any NGO can train the professionals and make them available to offer the appropriate services, then it would be a good solution. Also certain level of technologies such as sensors and upgrading the maps”.

¹³ [HTTP://ITI.LK/](http://ITI.LK/)



MR. BANDARA LOST HIS SHOP IN THE LANDSLIDE, BUT HAS NOW RENTED A NEW SHOP SPACE.

Perception of People about the Peradeniya Landslides

According to Y.M.A. Bandara, the secretary of the Peradeniya Traders' Association, the landslide caused him losses of about EUR 26,675 worth of assets and properties including his shop and the commercial materials. The vendors at Peradeniya town didn't know about any signs of the landslide till it happened in November 2006. Another seven shops also destroyed completely. Fortunately, there wasn't any damage to the lives of the people who were at the shops and the passengers on the road. He is renting out an office space and continuing his business. The other vendors who lost their shops have given up their business after the disaster.

The vendors had insured their buildings, but the insurance agent refused to give the compensation. They filed a court case at the Kandy District Court, but finally the insurance agent won and they only got EUR 2,964 as compensation.

The National Building Research Organization has informed them that the area is within a 100 meters radius from the present site of the landslide. The government authorities have requested them to move to a new proposed site which is about 1.5 km away.

The vendors who lost their shops have made three requests to the Government:

1. If their previous lands are acquired by the government, then to provide the value of their lands in cash
2. Or allowing them to rebuild their shops at the same site on a long term lease
3. Or government to build the buildings and then sell the buildings to them

However, their requests have not seriously been taken into account by government officials and parliamentarians.

They also need support in the form of engineering consultations on designing the shops at the particular location, where they can continue their business without any risks in the future.

Identified New Projects and Funding Needed:

- 1) Installation of landslide sensors to strengthen the warning system
- 2) Assisting the victims in designing their building and infrastructure by providing engineering consultations

Installation of landslide warning systems

Activity /Description	Unit cost in LKR	Unit	Total units	Total cost in EUR
Landslide sensors with sirens	250,000	Nos.	100	148,195
Installation costs	50,000	Nos.	100	29,639
Transport	100,000	Trip	1	592
TOTAL				178,426

Engineering Consultations to the Victims of Landslide in Designing Their Homes and Buildings

Activity /Description	Unit cost in LKR	Unit	Total units	Total cost in EUR
Engineering consultancies to the Peradeniya vendors in reconstruct their buildings	5,000,000	Lump sum		29,639
TOTAL				29,639

Conclusions and Recommendations

The impacts of climate change are already felt by the people in Sri Lanka. Whether it's fishermen on the coast, farmers inland or small shop owners in the hilly central parts – they have all been affected by 200 years of greenhouse gas emissions from industrialized countries.

There's an immediate need to adapt to the effects of climate change in Sri Lanka. The ideas, knowledge and capacity exist in the country, but are not widespread. Most importantly, the money needed to move to implementation is missing.

The projects in this summary report came about because there was some funding available from sources *other than* proper climate finance. If funds in the form of new and additional climate finance are made available, instant replication of successful adaptation measures could take place, benefitting many more people in Sri Lanka.

Looking beyond the studied areas in Sri Lanka, it's easy to see the similar situations and needs in other – bigger – parts of the world, including Asia, Africa and Latin America.

As a side effect, this summary report clearly shows the interlinkages between general development assistance and supporting

climate change affected people and countries. This means the work should be done in tandem, but additional funds need to be provided.

The adaptation measures and funding needs in the case studies covered in this summary report by no means implies that they are the only projects urgently required to be implemented. There is however an immediate need and possibility to replicate the projects in covered in this study, for which funding is needed.

Recommendations

- » Developed countries need to *provide new and additional climate finance*, at a minimum at the levels of the \$100 billion stated in the Copenhagen Accord.¹⁴
See Diakonia calculations for country shares.^{15, 16}
- » Climate finance should *strengthen existing development cooperation* (ODA), not build separate structures.
- » Climate finance needs to be *accessible* to the people who need it.
- » Needs and measures of climate change adaptation are known well enough to *not delay action*, but there's still a need for further research and mapping. Such research and mapping require climate finance.

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¹⁴ [HTTP://UNFCCC.INT/RESOURCE/DOCS/2009/COP15/ENG/L07.PDF](http://unfccc.int/resource/docs/2009/cop15/eng/l07.pdf)

¹⁵ [HTTP://WWW.DIAKONIA.SE/GLOBALASSETS/DOCUMENTS/DIAKONIA/CAMPAIGNS/SPRINGNOTAN-2013/EU-SHARES-OF-INTERNATIONAL-CLIMATE-FINANCE.PDF](http://www.diakonia.se/globalassets/documents/diakonia/campaigns/springnotan-2013/eu-shares-of-international-climate-finance.pdf)

¹⁶ [HTTP://WWW.DIAKONIA.SE/GLOBALASSETS/DOCUMENTS/DIAKONIA/CAMPAIGNS/SPRINGNOTAN-2013/SVERIGES-ANDEL-AV-INTERNATIONELL-KLIMATFINANSIERING-2.PDF](http://www.diakonia.se/globalassets/documents/diakonia/campaigns/springnotan-2013/sveriges-andel-av-internationell-klimatfinansiering-2.pdf)

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