

PACIFIC ADAPTATION TO CLIMATE CHANGE –(PACC)
INCEPTION WORKSHOP - FIJI ISLANDS,
NAUSORI 10th September 2010

Impact of Climate Change on Agricultural Infrastructure in Fiji

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Agricultural Infrastructure

- ◎ Mostly Hydraulic Structures
 - Open channels
 - Outfall structure
 - Floodgates
 - Flap gate
 - Storage structures, dam, reservoir– etc

To regulate the water for Agri.

- ⦿ Requirement
- ⦿ To avoid “ Too Less / Too Much of Water”
 - For Agricultural purpose
 - Introduce the water regulating structures
- ⦿ Design the structure
 - Hydraulic Aspect
 - Structural Aspect

Hydraulic Design of the Structure.

- Input Design Data

- Generate based on Hydrological Data
- Set for the required condition on type of crop

- Hydrological data (historical records)

- Related to Weather & Climate

- E.g. Rainfall  Runoff

- Design Rainfall  Design Runoff

Size / capacity of Structure



- ◎ Design Runoff (Discharge) -
 - Dependant parameter on Rainfall – Weather
 - Weather is affected due to the CC
 - By chain action, Rainfall → Runoff are also affected.

Typical Example – Drainage Structure

- Floodgate Out fall structure



Data - Design Criteria ; based on rainfall data of **earlier than last 20-30years**

- Crop: Sugarcane – can survive 3day inundation
 - Hydrological data : 1:10 yr. Return period one day rainfall ~ 260mm
- 
- Runoff ~ 0.01 cumec / Ha
- 
- Total volume of flood water, to be discharged during low tides in 3days

Design (Hydraulic)

○ Determine:

- No. Of discharge barrel (opening) of structure
- Size (breadth x depth) of opening (barrel)
- To meet the design requirement and criteria

Existing infrastructure

- ⦿ Existing drainage structures were
 - Designed &
 - Constructed since last over 20-30years
- ⦿ Design data used:
 - Historical rainfall data of earlier than last 20 – 30years
- ⦿ Due to CC, weather pattern, rainfall characteristic of recent past 2-3 decade will highly influence on the design input data

Intensity of Flood



Effects of Flood on Food Security



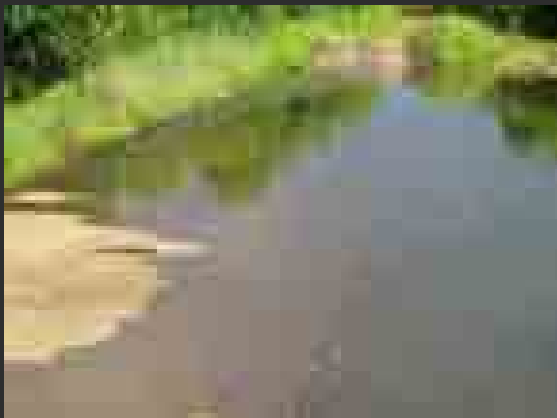
High intensity rainfall & Flooding due to the CC



Salt water intrusion – King Tide



Tidal Water Intrusion



Should we look into

- ① The Adequacy of existing Structures
- ① The Capacity of existing structures
- ① The Serviceability of existing structures
 - Due to the Impact of recent & future CC ??

It is part of the PACCC (Fiji) project – (technical assistance)

- Review and analyse on the existing design criteria of the drainage structure and the situation of drainage facilities to meet the present / future rainfall pattern, influenced by the CC
- Out put 1: Guidelines for design of drains and drainage networks to adapt to future rainfall regimes
- Demonstrate in the pilot areas/ in future new development

Revise the design criteria

- Analyse on rainfalls – including updated data
- To link up with CC scenarios
- To determine revised design criteria, adaptable to CC

Adaptation – no regret approach

- Regular & timely maintenance of drainage net works & outfall structures
- Regular clearing in outlet waterways
- Construction of additional flood relieve simple structures (not expensive ones)
- Public awareness and dissemination for adaptation and preparedness on CC impact

One Barrel Flap gate : *enhancing* structure to the Tidal gates [normal & flood time condition]



Deepening & widening of Outlet Waterways from outfall structure.



Part of Qarniki Creek, natural outlet drain (near Vunivaivai Bridge) water hyacinth and weeds hinder the free flow of water in the drainage system



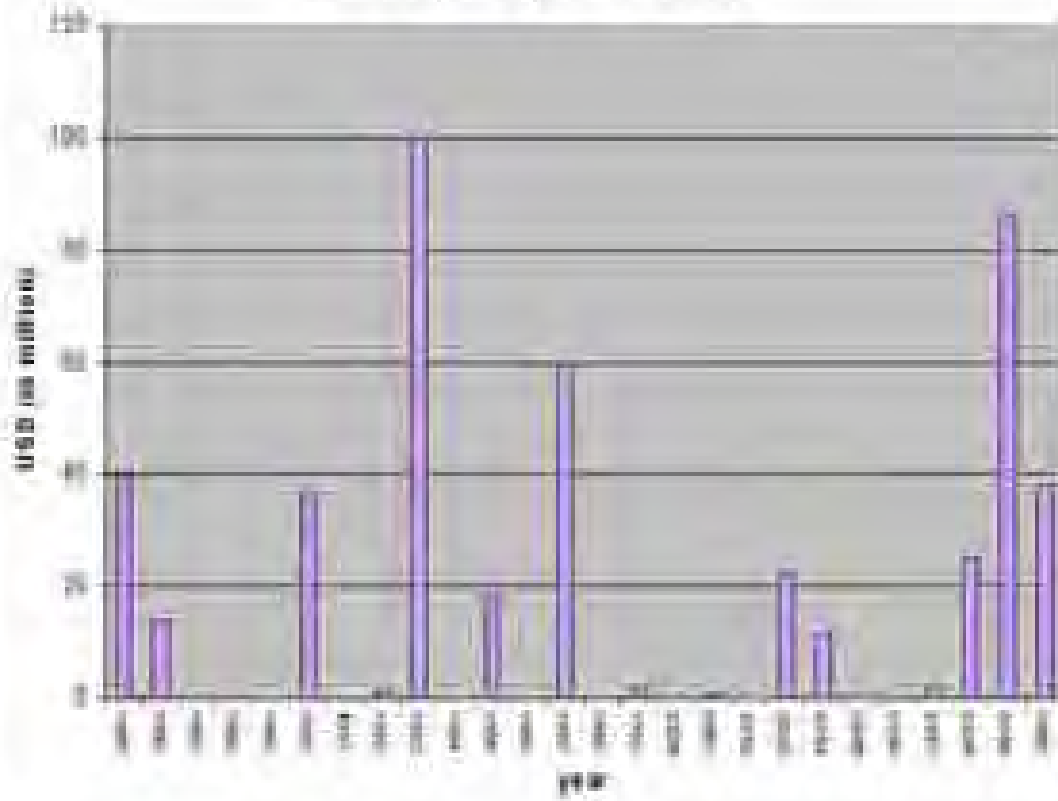
Thank you for your time

Climate is changing due to global warming

⦿ Effects on

- Temperature
 - Precipitation : rainfall; cyclone;
 - Drought
 - Sea level rise
-
- In terms of extreme events, frequency, intensity

Disaster Damage Est. Cost (Fiji)



year	damage cost, USD (x million)	Disaster name
1985	39.7	TC ERIC & NIGEL
1986	14	TC RAJ
1987		
1988		
1989		
1990	36.3	TC RAE & TC SINA
1991		
1992	1.6	TC JONI
1993	100	TC KINA
1994		
1995	18.3	TC GAVIN
1996		
1997	60	TC JUNE
1998		
1999	2	TC DANI
2000		
2001	0.8	TC PAULA
2002		
2003	22.1	TC AMI
2004	11.6	F/FLOOD
2005	0.056	F/FLOOD
2006		
2007	1.8	F/FLOOD & TC CLIFF
2008	25	TC GENE/F/FLOOD
2009	86.1	TC MICK/ F/FLOODs
2010	37.9	TC TOMAS

Agricultural Infrastructure

⦿ Agricultural Drainage Infrastructure

- Drains - drainage network
 - Man-made channels
 - Natural outlet channels – creek, river
- Outfall structures - tidal gates
 - Flood gates (mitre gates)
 - Flap gates
- Over flow spillways
- Sea water (tidal water) protection dike – seawall
- Culvert crossings
- Farm access roads

Irrigation hydraulic structure

- ① Irrigation supply canals
 - Main/ Secondary / Tertiary supply canals
- ① Drains
 - Farm drains / medium collector drains / main outlet drains
- ① Field structures
 - Off-take structures / sluice gates
 - Culvert crossing / canal bunds
 - Hydraulic drops
 - Siphon structure

Irrigation hydraulic structure

- ◎ Dam -
 - For irrigation or multi-purpose
- ◎ Diversion Weir / barrage
- ◎ Water source – reservoir / pond/ natural creek, river
- ◎ Control gates
- ◎ Intake gates
- ◎ Supply pipes / conduits
- ◎ Canal access road

Agricultural Drainage in Fiji

- Western Division - Sugar cane
 - Flat lands/ tidal influence/ arid zone
 - No. Of drainage schemes – 50
 - Drains (main drain) length - km
 - Benefited area - Ha
 - Seawall - km
 - Outfall structures – tidal gates no.
 - Developed in

Agricultural Drainage in Fiji (contd)

○ Northern Division - Sugarcane

- Flat lands/ tidal influence/ arid zone
- No. Of drainage schemes –
- Drains (main drain) length - km
- Benefited area - Ha
- Seawall - km
- Outfall structures – tidal gates no.
- Developed in

Agricultural Drainage in Fiji (contd)

- Central Division – Non-sugar crops
 - Flat lands/ tidal influence/ wet zone
 - No. Of drainage schemes – 50nos.
 - Drains (main drain) length - 600km
 - Benefited area - 13,152Ha
 - Seawall - 71km
 - Outfall structures – tidal gates 62no.
 - Developed in 1980-1992 (ADP)

Irrigation areas in Fiji

○ Northern Division - Rice

- Flat lands/ tidal influence/ arid zone
- No. Of irrigation schemes –
- Canal (main drain) length - km
- Benefited area - Ha
- Seawall - km
- Structures – tidal gates no.
- Head works
- Developed in

Irrigation areas in Fiji (contd)

◎ Central Division - Rice

- Flat lands/ tidal influence/ arid zone
- No. Of irrigation schemes – 1 no.
- Canal (main drain) length - km
- Benefited area - Ha
- Seawall - km
- Structures – tidal gates no.
- Head works
- Developed in

