

Assessing Risks to Public Infrastructure

A regional perspective from Central America

Colegio Federado de Ingenieros y de
Arquitectos de Costa Rica

M.Sc. Freddy Bolaños C.

Sanitary Engineer



WFEO/FMOI

Addressing Infrastructure in a Changing Climate

World Engineers' Convention Special Session

COMMITTEE ON ENGINEERING AND THE ENVIRONMENT



Regional Setting



- Impact on water resources by changes in **climate & land use**
- Lack of hydrological data gathering and monitoring
- Human and technological capacity does not keep pace with change



WFEO/FMOI

Addressing Infrastructure in a Changing Climate

World Engineers' Convention Special Session

COMMITTEE ON ENGINEERING AND THE ENVIRONMENT



Regional Climate Variability



Existing or Potential Impacts

- Systematization of information of extreme events (disasters)
- Food production
- Damage to infrastructure
- Loss of life
- Economic
- Public health.



WFEO/FMOI

Addressing Infrastructure in a Changing Climate

World Engineers' Convention Special Session

COMMITTEE ON ENGINEERING AND THE ENVIRONMENT

IMN Costa Rica
engineerscanada  ingenieurscanada

Key Issues to Consider

- Infrastructure life-cycle
 - Identification of critical vulnerabilities
- Standardized assessment procedures
- Need for a greater focus on adaptation



WFEO/FMOI

Addressing Infrastructure in a Changing Climate

World Engineers' Convention Special Session

COMMITTEE ON ENGINEERING AND THE ENVIRONMENT



Costa Rica Case Study

Limon Sewage Treatment Plant

Key Components

- Collection System
- Treatment
- Disposal of effluent and residuals



WFEO/FMOI

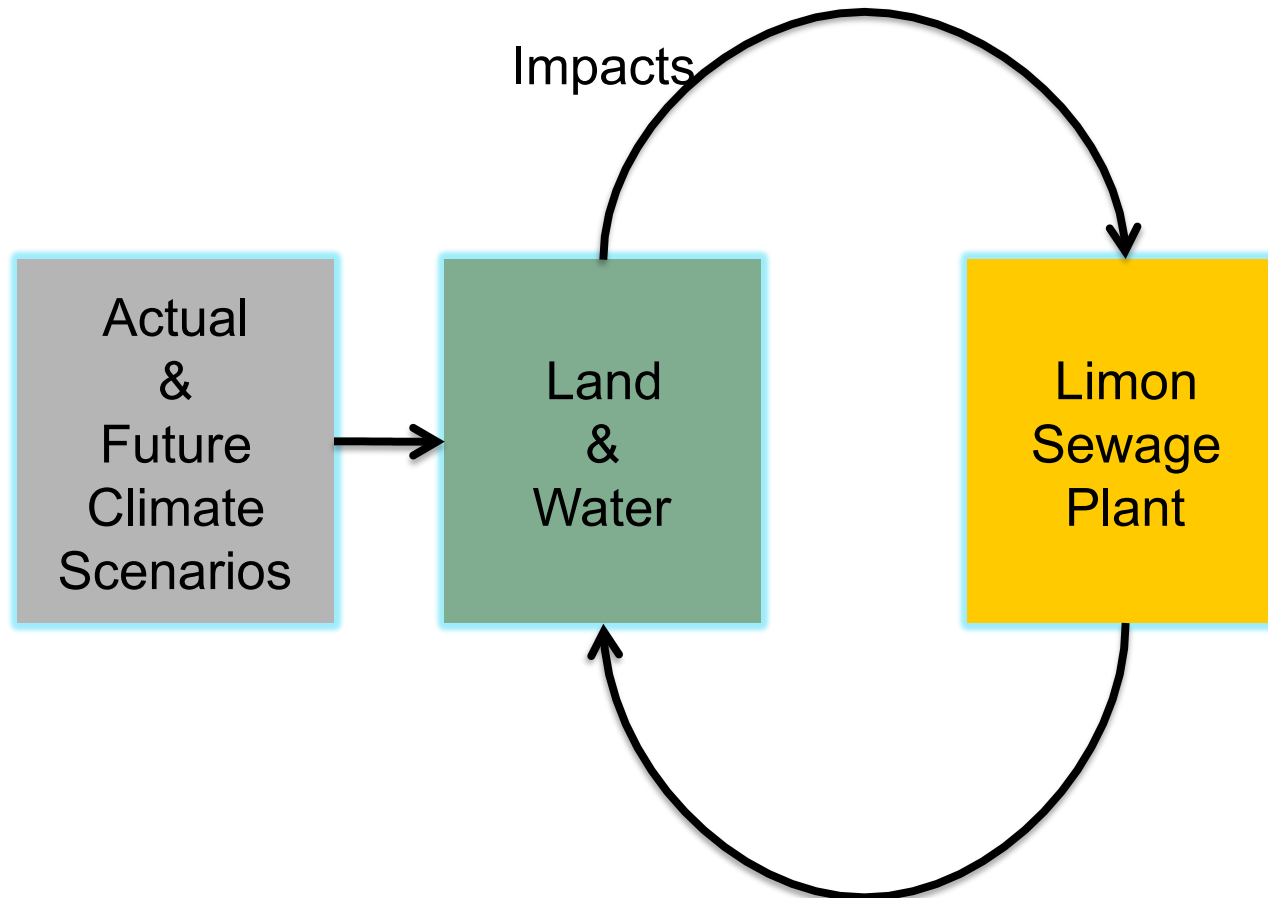
Addressing Infrastructure in a Changing Climate

World Engineers' Convention Special Session

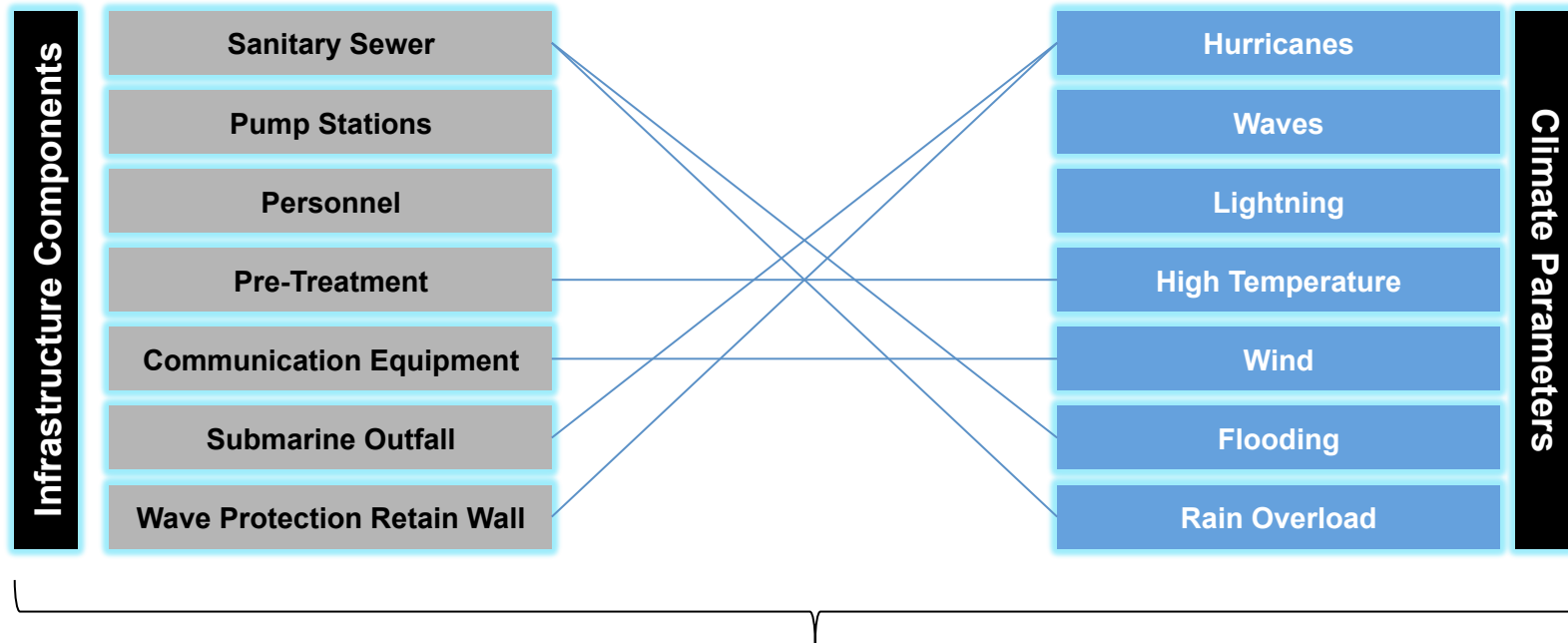
COMMITTEE ON ENGINEERING AND THE ENVIRONMENT



Everything is connected



Protocol to Assess Risk



$$\text{Probability} \times \text{Severity} = \text{Risk}$$



WFEO/FMOI

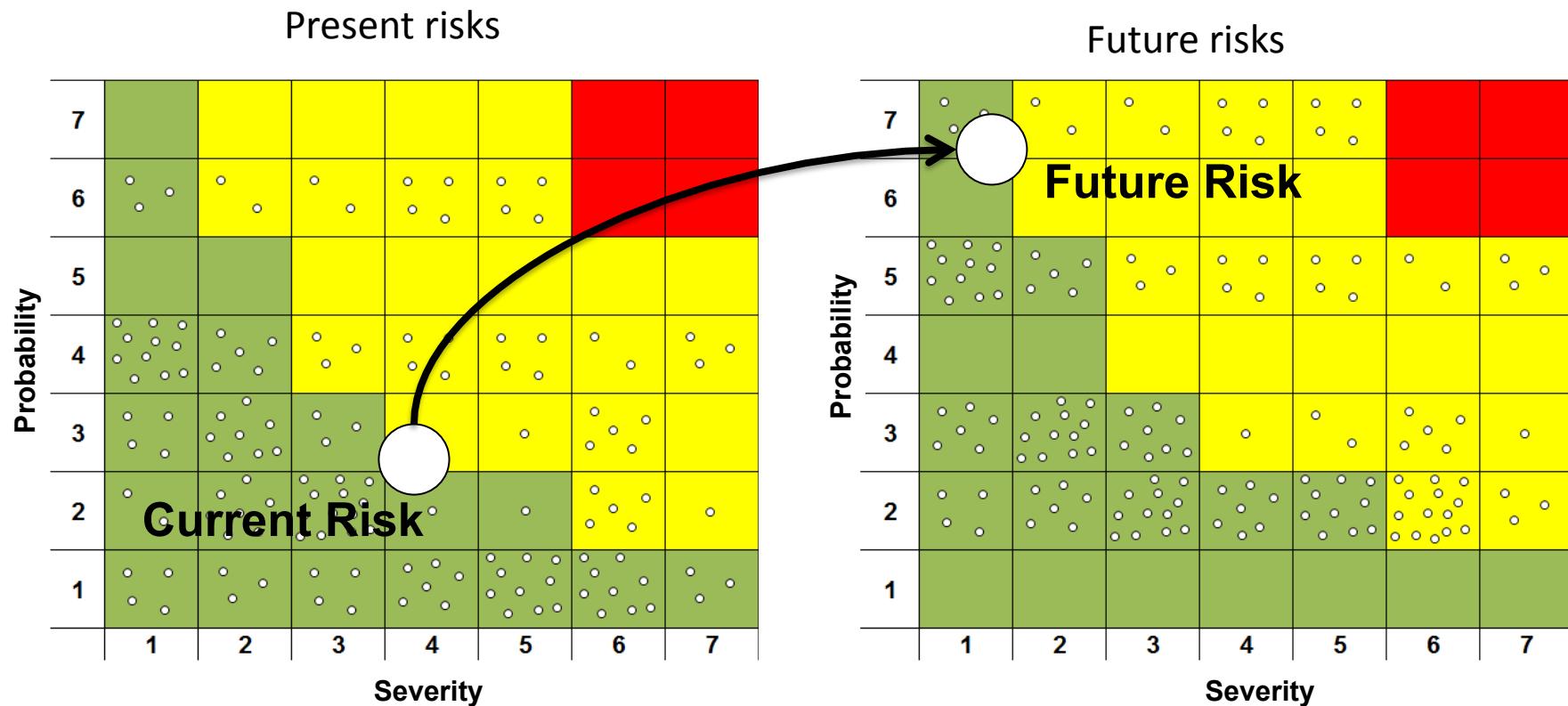
Addressing Infrastructure in a Changing Climate

World Engineers' Convention Special Session

COMMITTEE ON ENGINEERING AND THE ENVIRONMENT



Future Climate Scenarios Impact Risk



- 32 Percent of infrastructure components changed from LOW to MED risk

Components with highest risks

Infrastructure component	Climate parameter	Act prob	Fut prob	Sev.	Act risk	Fut risk
Asis Esna	Flooding rain	4	5	7	28	35
Pacuare 2		4	5	7	28	35
Lock gates, screens, Parshall canal, internection canal		4	5	7	28	35
Collectors and subcollectors	Overload rain	6	7	5	30	35
Inland mini pumping stations		6	7	5	30	35
Asis Esna		6	7	5	30	35
Lock gates, screens, Parshall canal, internection canal		6	7	5	30	35
Collectors and subcollectors	Flooding rain	4	5	6	24	30
Coastal mini pumping stations		4	5	6	24	30
Coastal mini pumping stations	Overload rain	6	7	4	24	28
Pacuare 1		6	7	4	24	28
Pacuare 2		6	7	4	24	28
Tank		6	7	4	24	28
Inland mini pumping stations	Flooding rain	4	5	5	20	25
Pacuare 1		4	5	5	20	25
Tank		4	5	5	20	25
Overflow structure		4	5	5	20	25
Electric plant	Marine breeze	3	3	7	21	21
Pumps	Overload rain	6	7	3	18	21
Overflow structure		6	7	3	18	21
Pretreatment station	High temperature	4	5	4	16	20



Adaptation Actions

High temp	<ul style="list-style-type: none">•Redesign ventilation system at pretreatment station.
Lightning	<ul style="list-style-type: none">•Verify existence of electrical protection of equipment, replace or install.
Flooding rain	<ul style="list-style-type: none">•Install weather station and monitor•Clean and repair gutters•Further engineering analysis
Overload rain	<ul style="list-style-type: none">•Program to reduce illegal connections•Installation of weather station to monitor
Wind	<ul style="list-style-type: none">•Maintain testing program of FC in areas with no sewer.•Verify with wind speed/direction/contamination flume.



WFEO/FMOI

Addressing Infrastructure in a Changing Climate

World Engineers' Convention Special Session

COMMITTEE ON ENGINEERING AND THE ENVIRONMENT



General Conclusions

- The Risk Assessment (PIEVC) protocol introduces Climate Change in a systematic manner based on a broad climate analysis
- The best results for the application of the PIEVC protocol occurred
 - Where loading capacity was verified against extreme events that did occur
 - Where logs and registering documents were available.
- This made it possible to identify a loss in capacity or an out of service condition directly related to an specific climate event.
- The protocol helped determine priorities for adaptation
- Areas for further engineering analysis needed to justify improvements on the system were identified



WFEO/FMOI

Addressing Infrastructure in a Changing Climate

World Engineers' Convention Special Session

COMMITTEE ON ENGINEERING AND THE ENVIRONMENT



Conclusions for Central America

- Opportunities to share climate data
- Knowledge sharing on responses
- Need for standardized procedures for reconstruction
- No introduction of adaptation variable (reconstruction vulnerability)



WFEO/FMOI

Addressing Infrastructure in a Changing Climate

World Engineers' Convention Special Session

COMMITTEE ON ENGINEERING AND THE ENVIRONMENT



Muchas gracias

Contact:

Colegio Federado de Ingenieros y de Arquitectos
Eng. Freddy Bolaños C
E.mail: fbolanos@cfia.cr
Phone: (506)22023925
P.O.Box: 2346 – 1000 Costa Rica



WFEO/FMOI

Addressing Infrastructure in a Changing Climate

World Engineers' Convention Special Session

COMMITTEE ON ENGINEERING AND THE ENVIRONMENT



Diagram of the scope's project

