Climate Change in Coastal Canada: What happens when the weather is out of control and ice caps melt?

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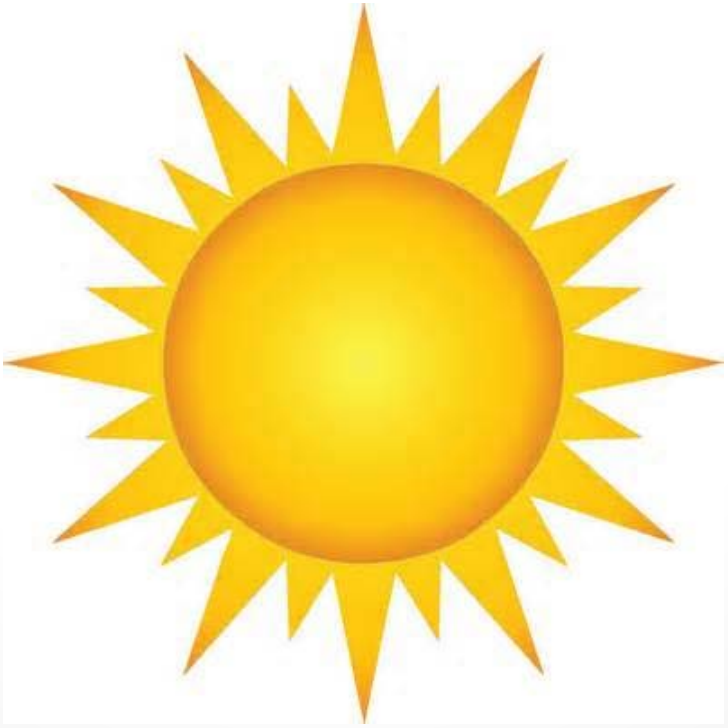
The evening news

- February 10, 2050
- Currently 21^{o}C



Fredericton: spring flooding

- After the 10th year in a row with historical flooding, the government has decided to not rebuild along the St John River: all buildings will be demolished

International news

- Refugees
- Trinidad & Tobago
- Land given by US federal government

Crazy??

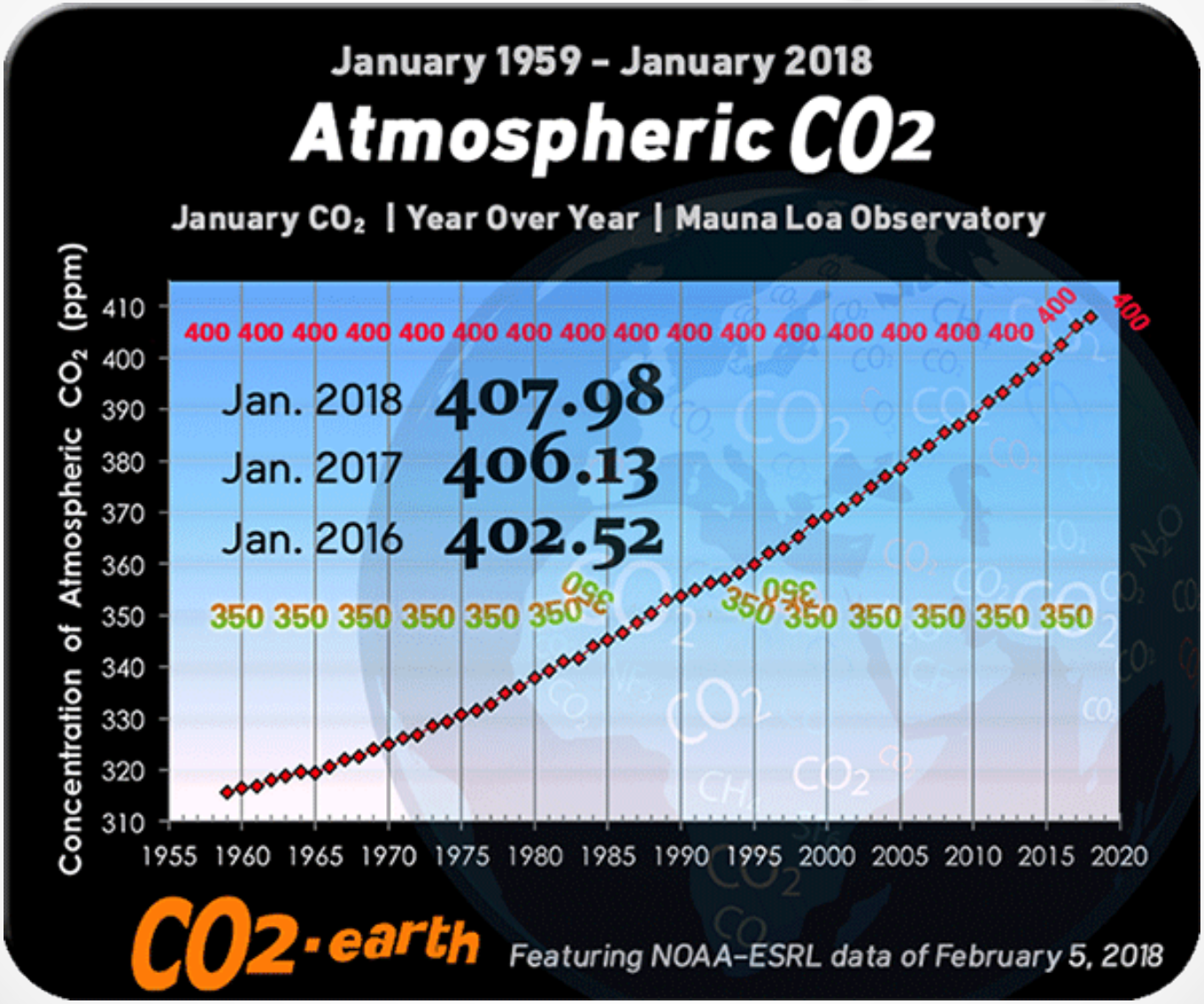
Climate change: a recap

- Intergovernmental Panel on Climate Change's 5th Assessment Report (2013):

- "In the Northern Hemisphere, 1983–2012 was likely the warmest 30-year period of the last 1400 years"

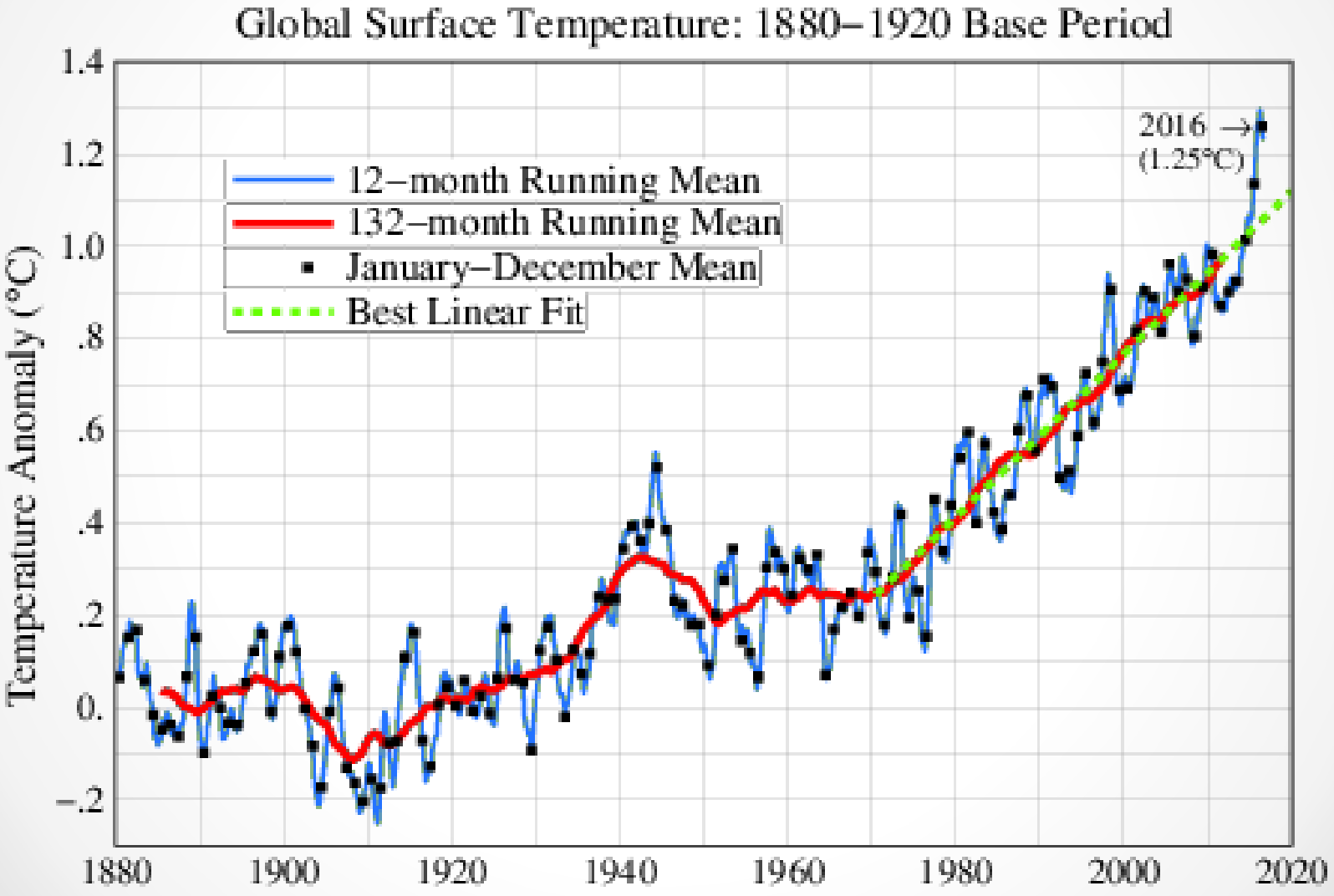
- "Human influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, …".

Where are we going?



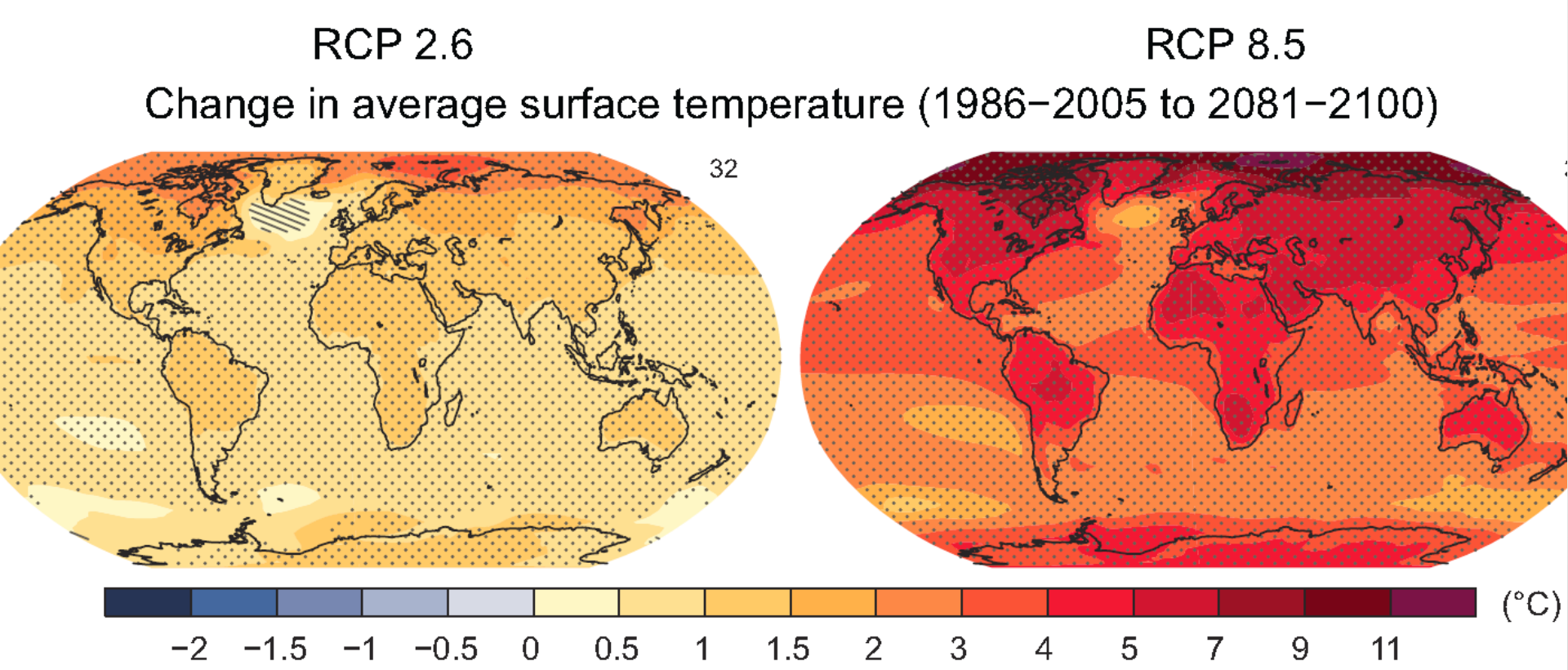
Source: https://www.co2.earth/

What does this mean?



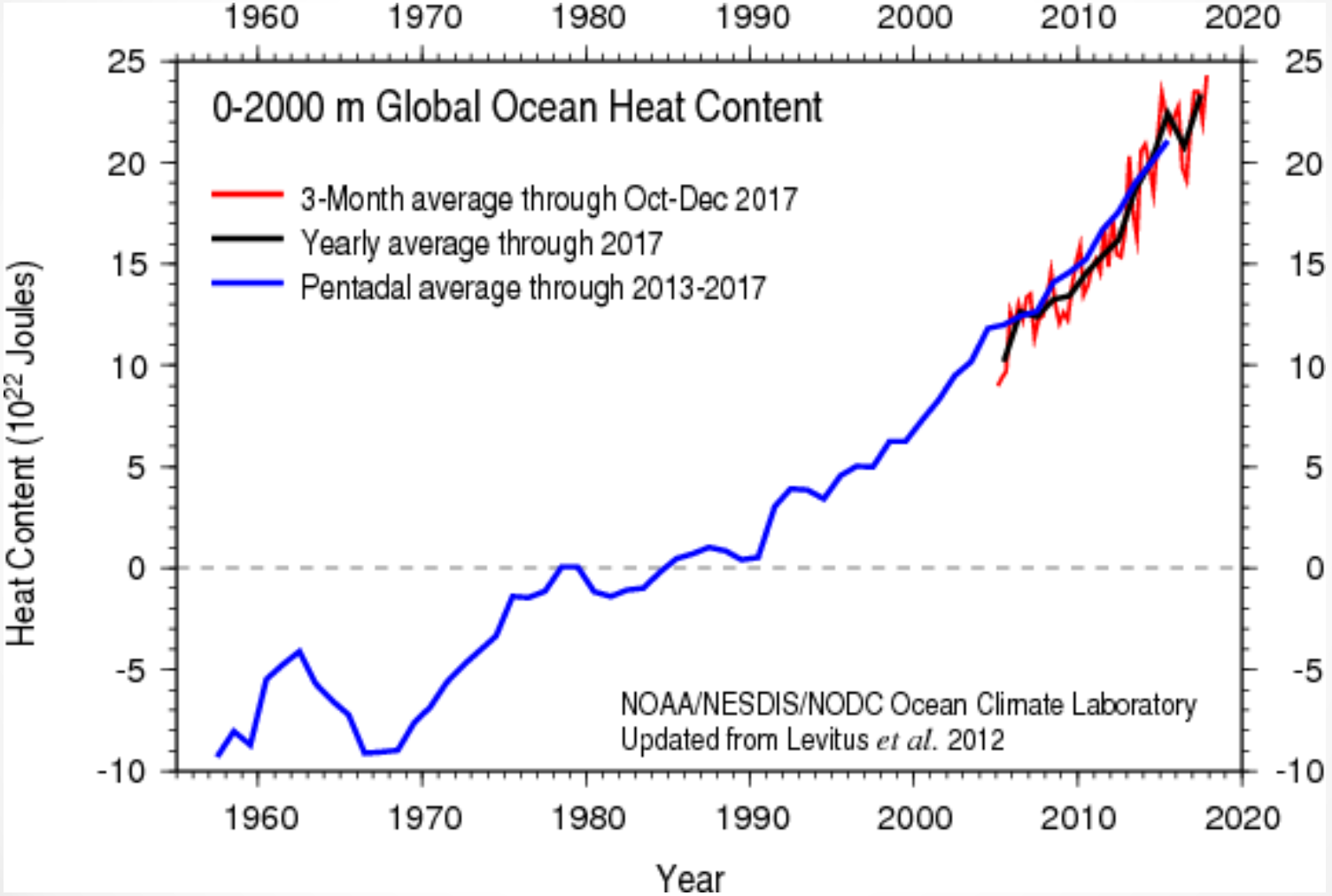
Source: https://data.giss.nasa.gov/gistemp/graphs/

AR5 scenarios for temperatures



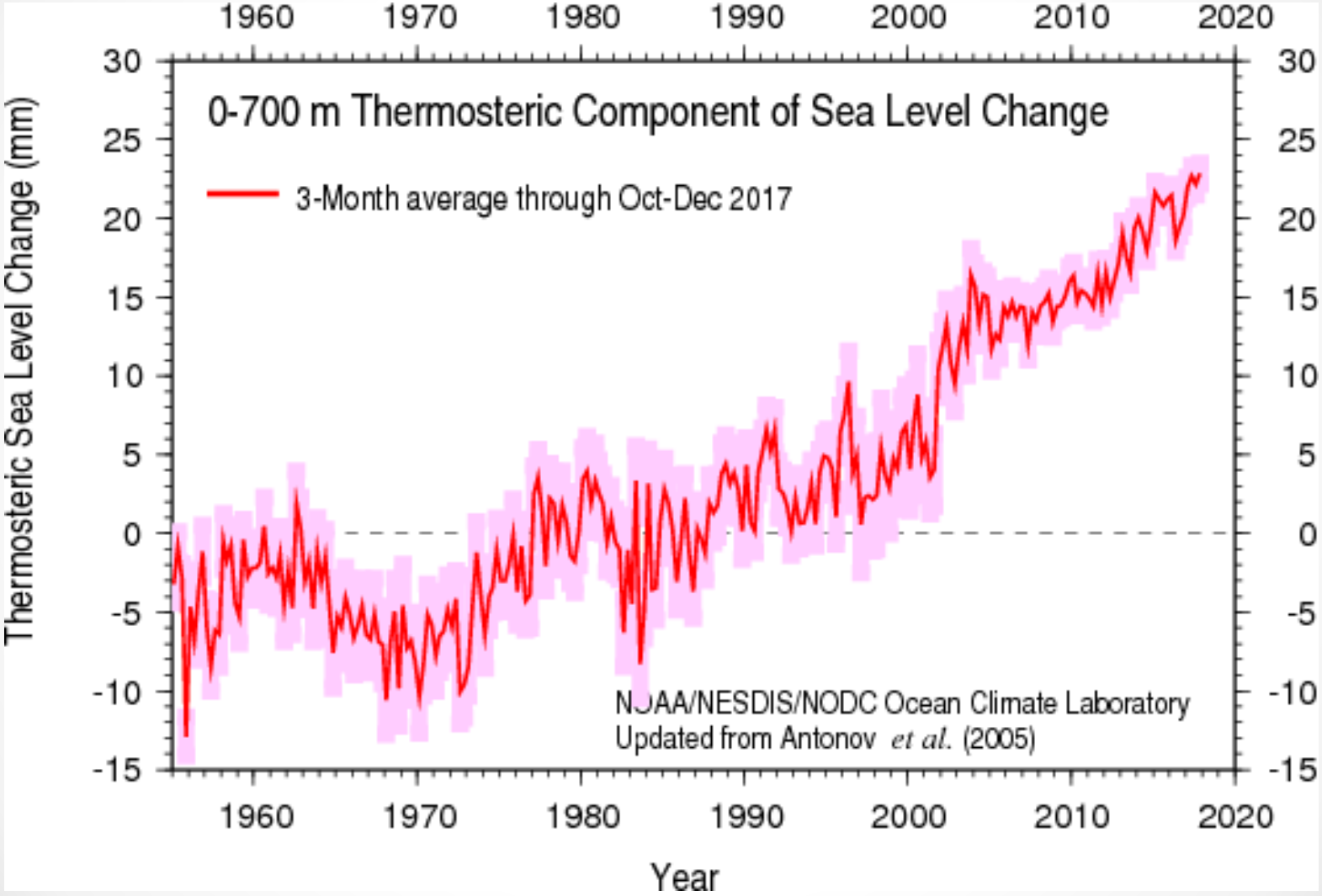
Source: https://www.ipcc.ch/pdf/assessment-report/ar5/syr/drafts/SYR_FOD_Topic2.pdf

What about the oceans?



- Source: https://www.nodc.noaa.gov/OC5/3M_HEAT_CONTENT/

Sea level rise



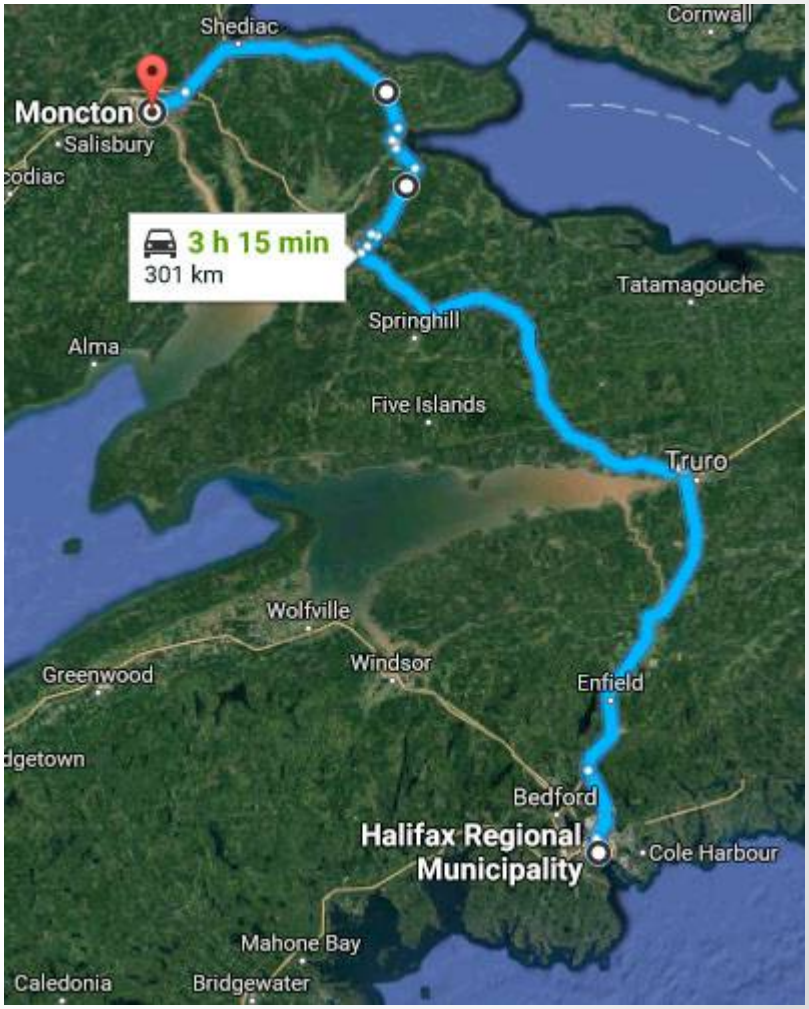
- Source: https://www.nodc.noaa.gov/OC5/3M_HEAT_CONTENT/

Sea level rise

Two Canadian places that could be under water in 100 years — or sooner

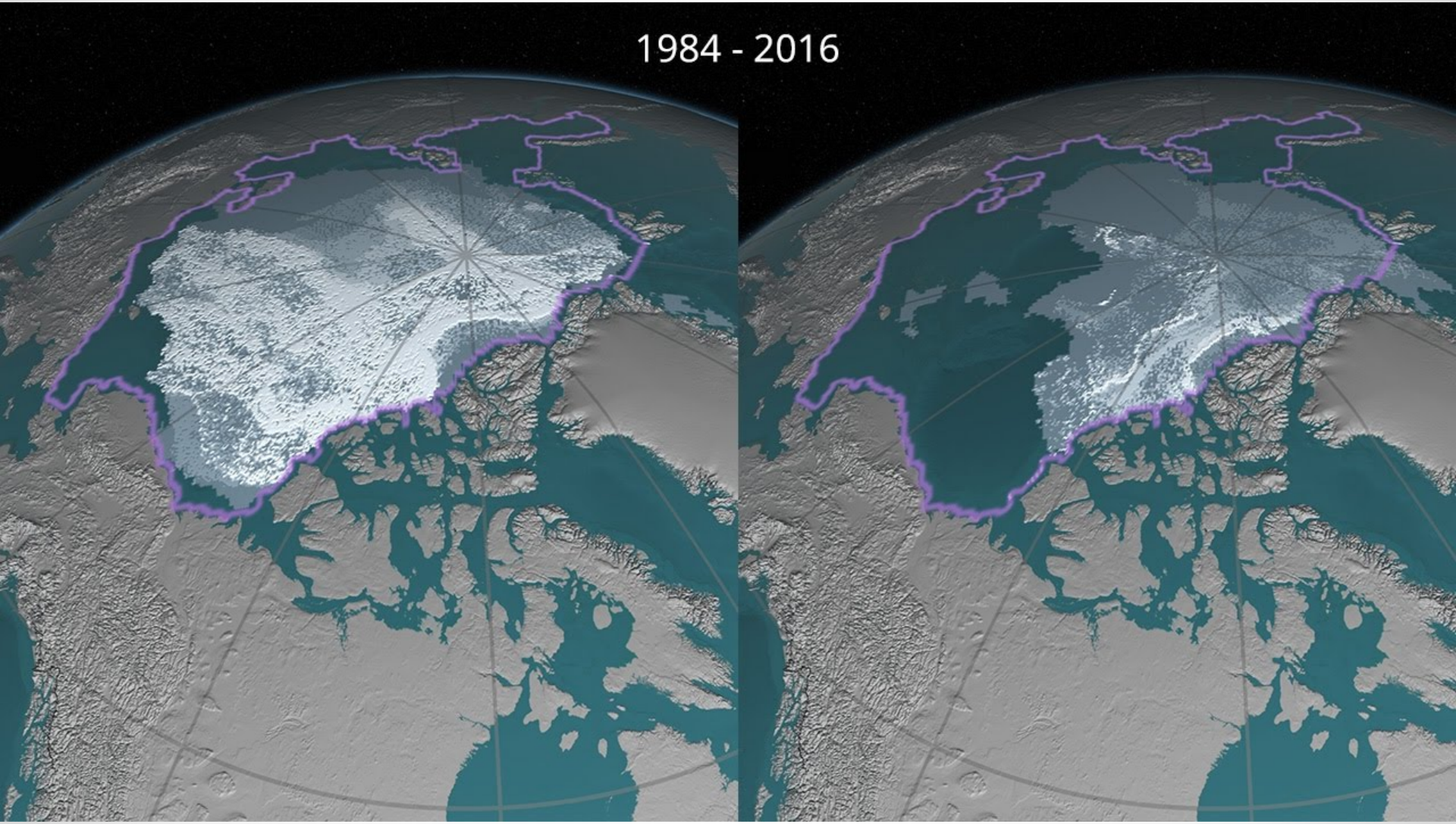
1. Vancouver

2. Tantramar Marsh in New Brunswick



- https://globalnews.ca/news/3845545/how-climate-change-affects-canada/

Reduction of Arctic ice cover



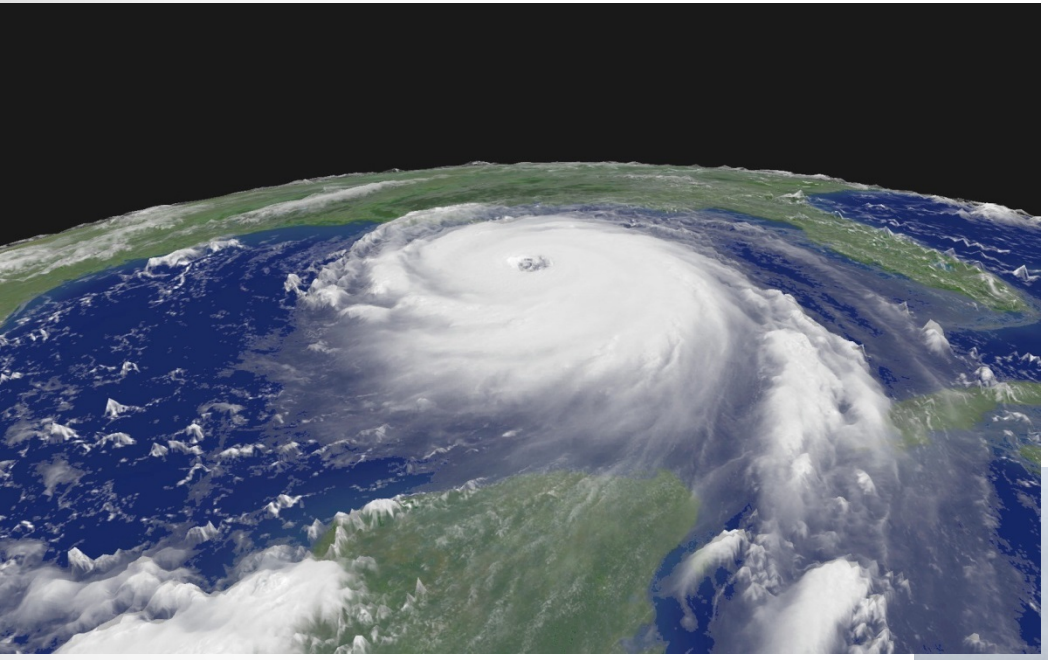
Source: NASA, 2016

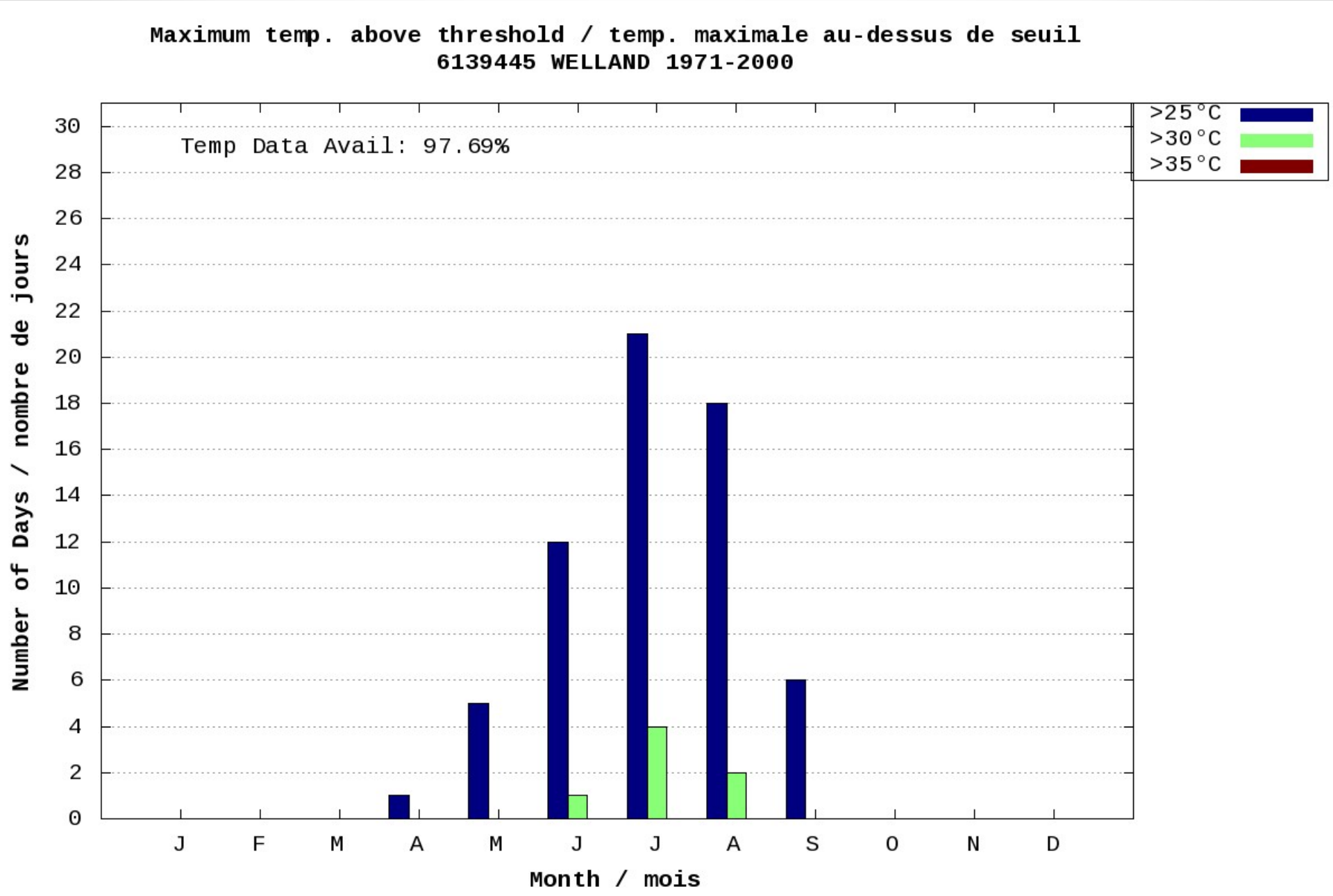
Changes in way of life

What are extremes events?

- Rare (5% occurrence) events
- Hurricanes, storm surges, flooding, heat waves, ice storms, etc.
- Intensity
- Frequency

Examples of extreme events




Maximum temp. above threshold / temp. maximale au-dessus de seuil
6139445 WELLAND 1971-2000
Temp Data Avail: 97.69%
>25°C
>30°C
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Number of Days / nombre de jours
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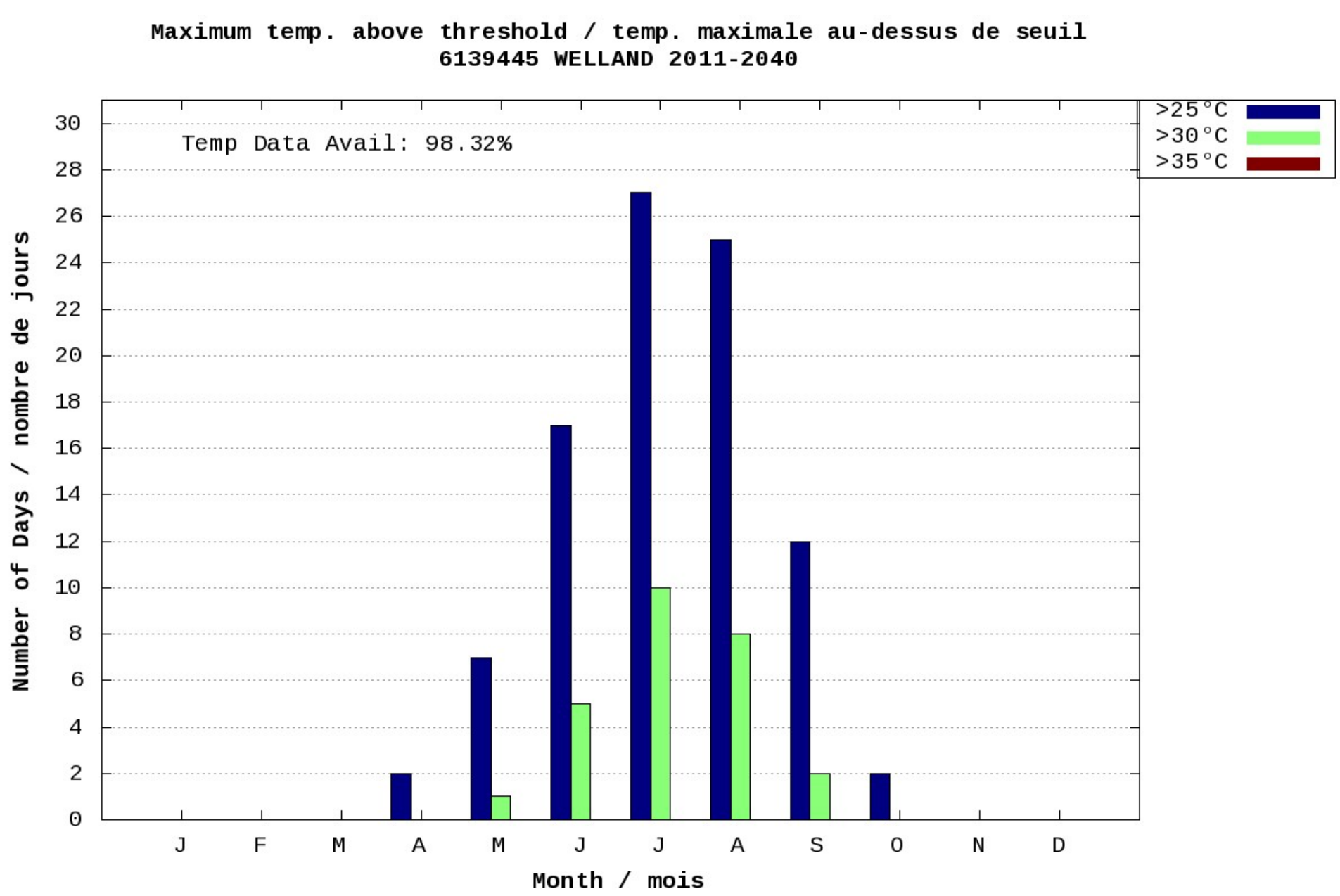
Maximum temp. above threshold / temp. maximale au-dessus de seuil
6139445 WELLAND 2011-2040
Temp Data Avail: 98.32%
>25°C
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Number of Days / nombre de jours
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Atlantic Canada

- Coastal rural communities and their conditions (demographic and socio-economic)
- Reliance on natural resources

Extreme events such as hurricanes and storm surges

Bouctouche, NB

Series of storms of December 2010

- Several communities of Quebec, New-Brunswick and Prince Edward Island impacted
- 77 municipalities in Québec: Public Security and Emergency measures

Social impacts

- CURA on climate change in coastal communities
- E.g. Ste Flavie
- High level of psychological stress and anxiety
- Even one divorce
- Still social conflicts in the community

http://www.tvcogeco.com/rimouski/gallerie/vos-albums/3483-tempete-a-ste-luce-sur-mer/30772-tempete-a-ste-luce-3

Vasseur et al. 2017

Gender differences in dealing with events

Men

- More active in the community
- Critical of government in particular, addressing a lack of financial interventions and support

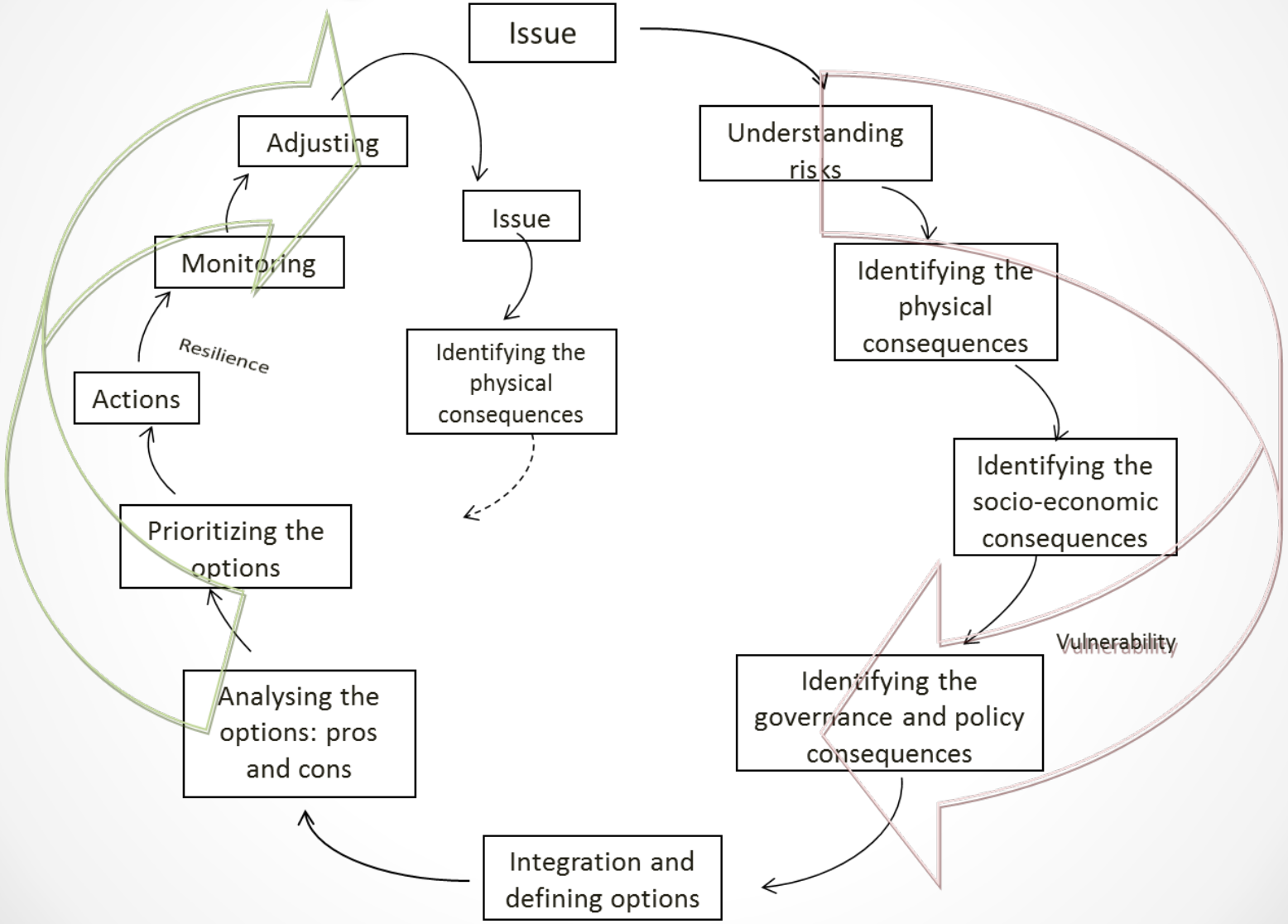
Women

- Forthcoming with their emotions, admitting to feeling fear and worry
- Perceptions in terms of impacts and actions closer to home

- Subtle differences may affect decisions and adaptive strategies
- Important to consider demographics

Vasseur et al. 2015

Working with communities



Vasseur 2012

Options for adaptation

Nature-based solutions

- Healthy, well-functioning ecosystems enhance resilience to climate and environmental changes
- Promoting the resilience of both ecosystems and societies
- Through conservation and restoration of biodiversity (from genetic to landscape)
- Improve the capacity of communities and ecosystems to adapt to changes and reduce disaster risks

Promoting the resilience of both ecosystems and societies

- Since 2009, the International Union for Conservation of Nature (IUCN) has promoted the adoption of Ecosystem-based Adaptation (EBA) as an operational tool for climate change adaptation.

What is ecosystem-based adaptation?

- The use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change (CBD 2009).



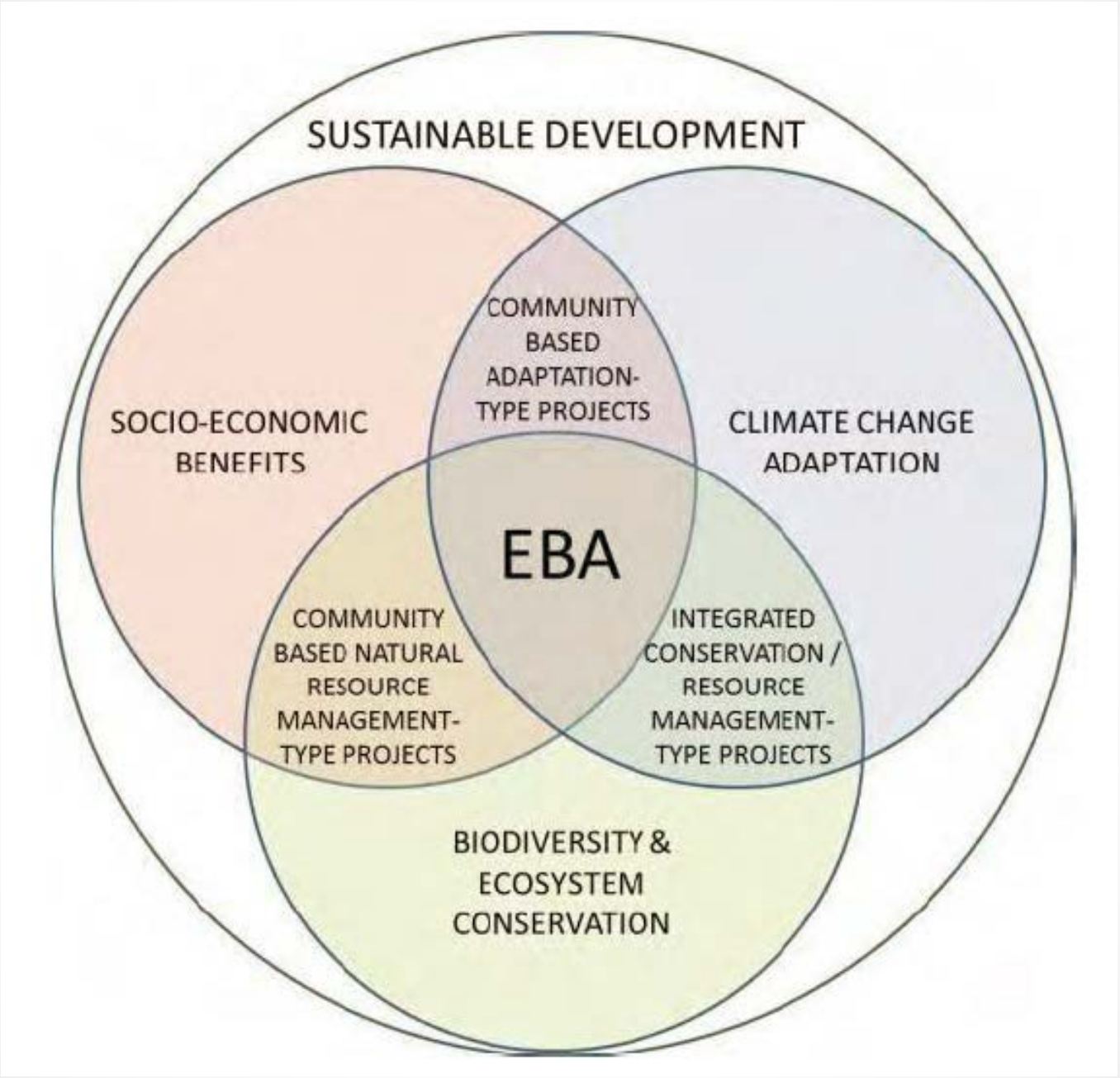

Why?

- Not “business as usual”
- Healthy (and resilient) ecosystem = healthy (and resilient) people
- Healthy ecosystems = diverse = more capacity to withstand extreme events

Why is it important for SDGs?

- EbA is also important to the SDGs, especially Goals on poverty reduction (1), zero hunger (2), climate action (13), sustainable use of natural resources (land and water) (14-15)

- It also contributes to sustainable cities and communities (11), decent work (8), good health and well being (3), and clean water (6)


SUSTAINABLE DEVELOPMENT
SOCIO-ECONOMIC BENEFITS
COMMUNITY BASED ADAPTATION-TYPE PROJECTS
CLIMATE CHANGE ADAPTATION
EBA
COMMUNITY BASED NATURAL RESOURCE MANAGEMENT-TYPE PROJECTS
INTEGRATED CONSERVATION / RESOURCE MANAGEMENT-TYPE PROJECTS
BIODIVERSITY & ECOSYSTEM CONSERVATION

Source: IUCN

Ingredients for EbA

- Local will as it is often community-based (although can be scaled up)
- Specific to local and cultural conditions
- Reducing social and environmental vulnerabilities

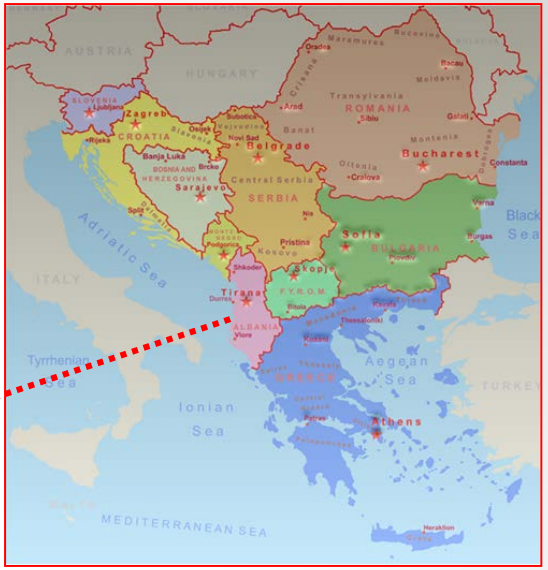
Acknowledging…

- Complexity and process (non-linearity)
- Footprint and accountability
- Transformation
- Question of time and space
- Engagement and trust building
- Transparency
- Scalability with flexibility and adaptability

Success criteria

- Institutions and adaptive governance
- Bottom up and community involvement (legitimacy)
- Stakeholder participation (ALL)
- People focused and livelihood security
- Ecosystem service benefits – use and non use

Project: EbA measures in the Drini-Mati River deltas, Albania



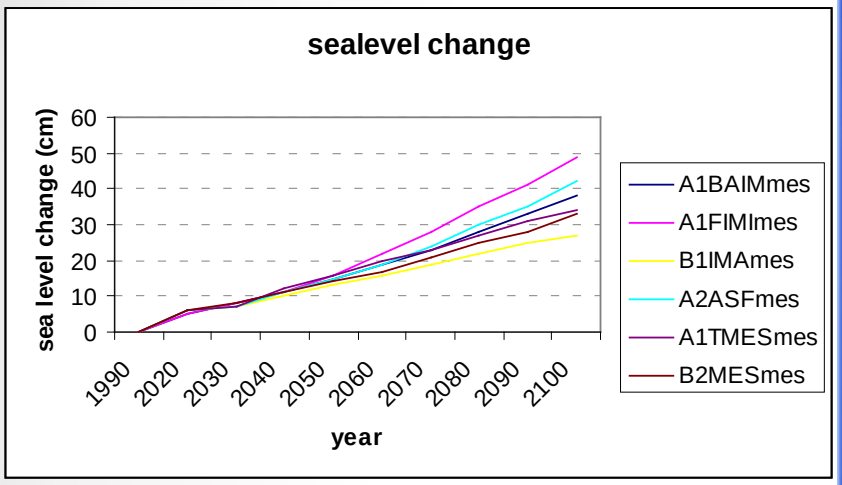
Project presented by:
Eglantina Bruci
UNDP Climate Change Programme
At Inter-regional Ecosystem-based Adaptation (EBA) Workshop, Beijing, 14 – 16 October 2013

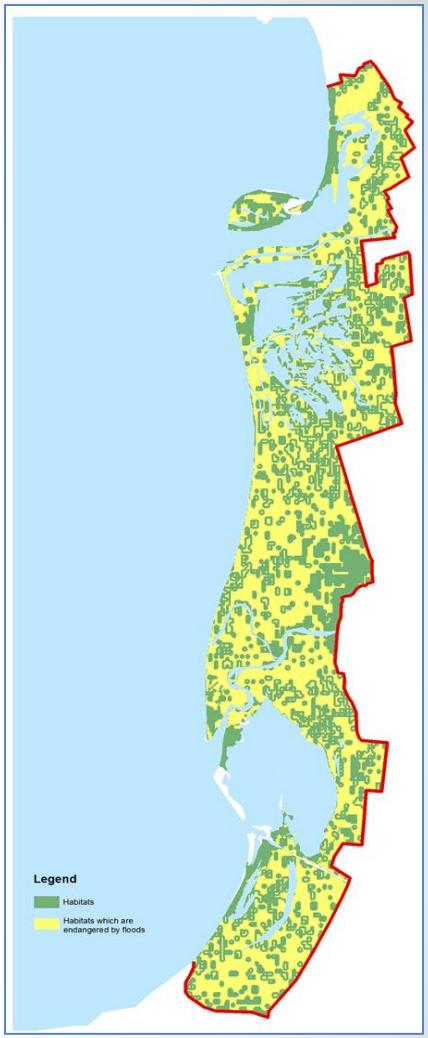
DMRD
DRINI MATI RIVER DELTA

Pressures

- Sea invasion due to erosion along the Drini River delta approx. 500 m during 1971-2005.
- Maladaptation
- Extreme events like storm surge, high tide, inundation

Scenarios



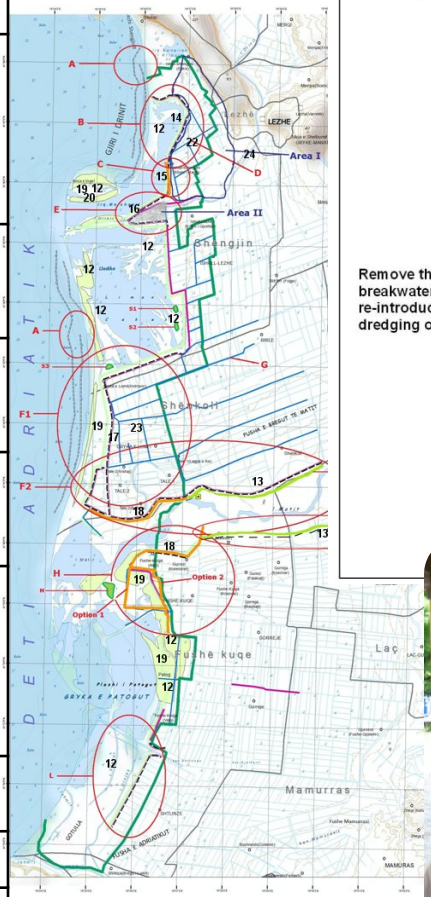


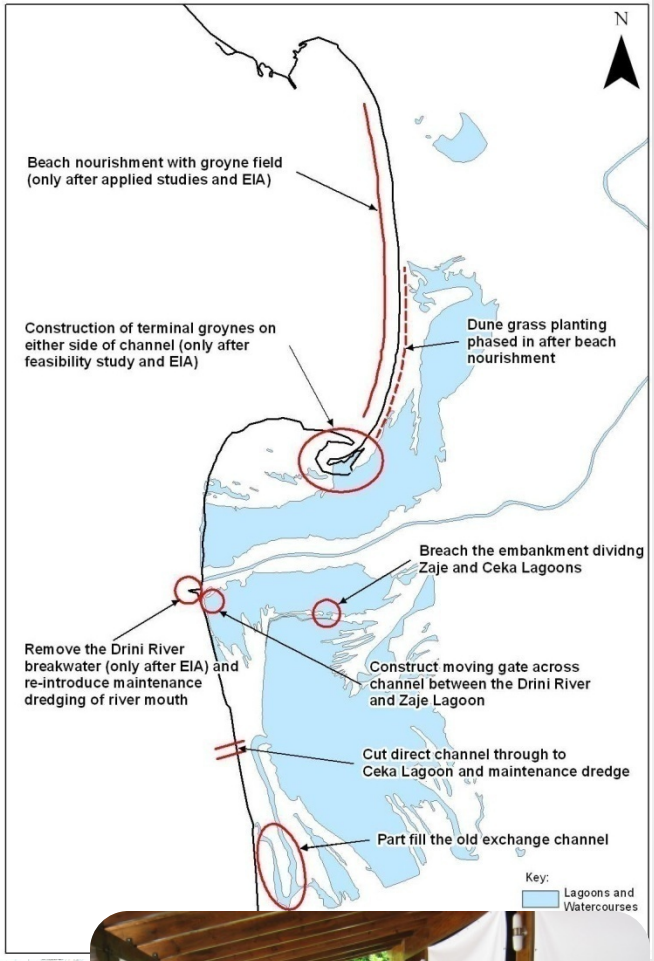
Coastline prediction for the year 2100 for the BMD area showing (in blue) the area of the current coastal zone that will be affected by sea level rise.;

and habitat losses

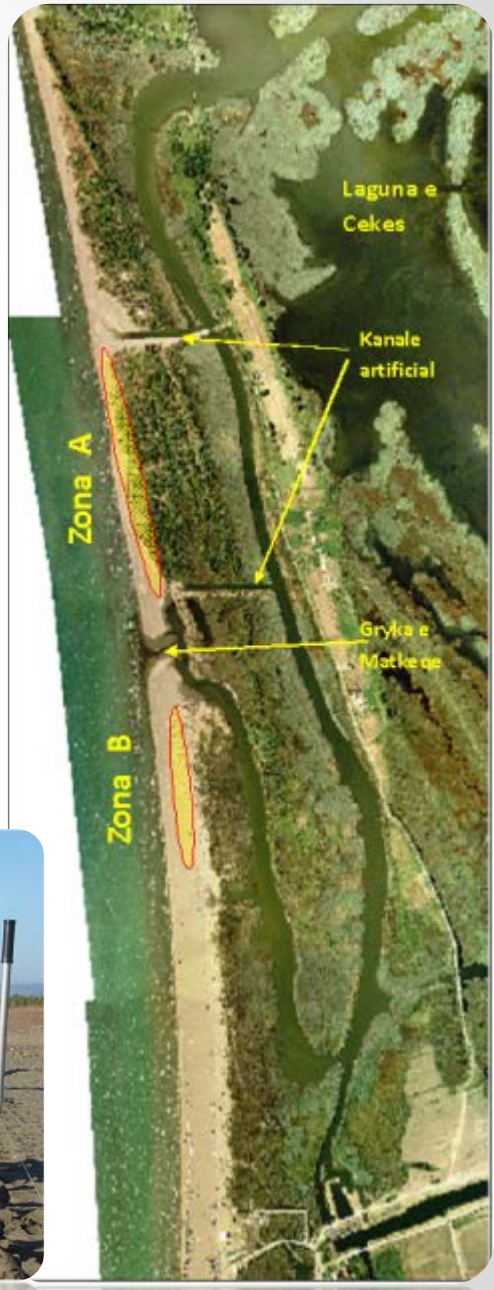
Adaptation measures

No	Project proposal	Measure
1	**Management of the fresh water in the Kune-Vain area (EbA)**	New wells over the PA Kune-Vain and Patok
4	**Management of coastal area (EbA)**	Reforestation of PA (pilot sites)
5	**Management of the connection channels in Kune area (engineering)**	Rehabilitation of channels connecting the water bodies within the Kune lagoon.
		Construction of terminal groynes
6	**Treatment of waste water in the DMRD area (EbA)**	Waste water treatment. Decentralized waste water treatment plants in Commune level.
8	**Management of the coastal erosion (EbA +engineering)**	Beach nourishment
		Restore the dune (planting)
		Construction of groyne field - Merxhani lagoon





Demonstration: coastal sand dunes restoration : planting with *Ammophila arenaria* (beach grass) both sides of Gryka e Matkeqes, Vain (Zona A + B)



By the way…

- $1 spent on restoring marshes and oyster reefs on the American Gulf Coast reduces storm damages by $7
- Salt marshes can reduce annual flood damages by at least 15 %.
- Mangrove restoration can reduce annual flood damages to people and property by 25 % across the entire nation of the Philippines

Mike Beck, Nature Conservancy

There are several approaches

Ecosystem services	Climate risks & impacts			
	Storm surge (coasts)	**Flooding (urban, riverine)**	**Food, fiber and biomass production**	**Heat waves (temperature extremes)**
Supporting		Soil formation for stabilization & reducing run-off	Sustainable land management	
Provisioning			Agroforestry	
Regulating	Reforesting or afforesting with mangroves	Stormwater run-off regulation		Green cover to reduce urban heat island

We only have one place

Credit: NOAA-NASA GOES Project

Taking care of it

Thank you!