

# Interconnectedness of ecosystems and human health: Lessons learned from the 2006 Suriname flooding

*Climate related Impacts on Global Health*

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# Presenter Disclosures

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**“No personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months to disclose”**

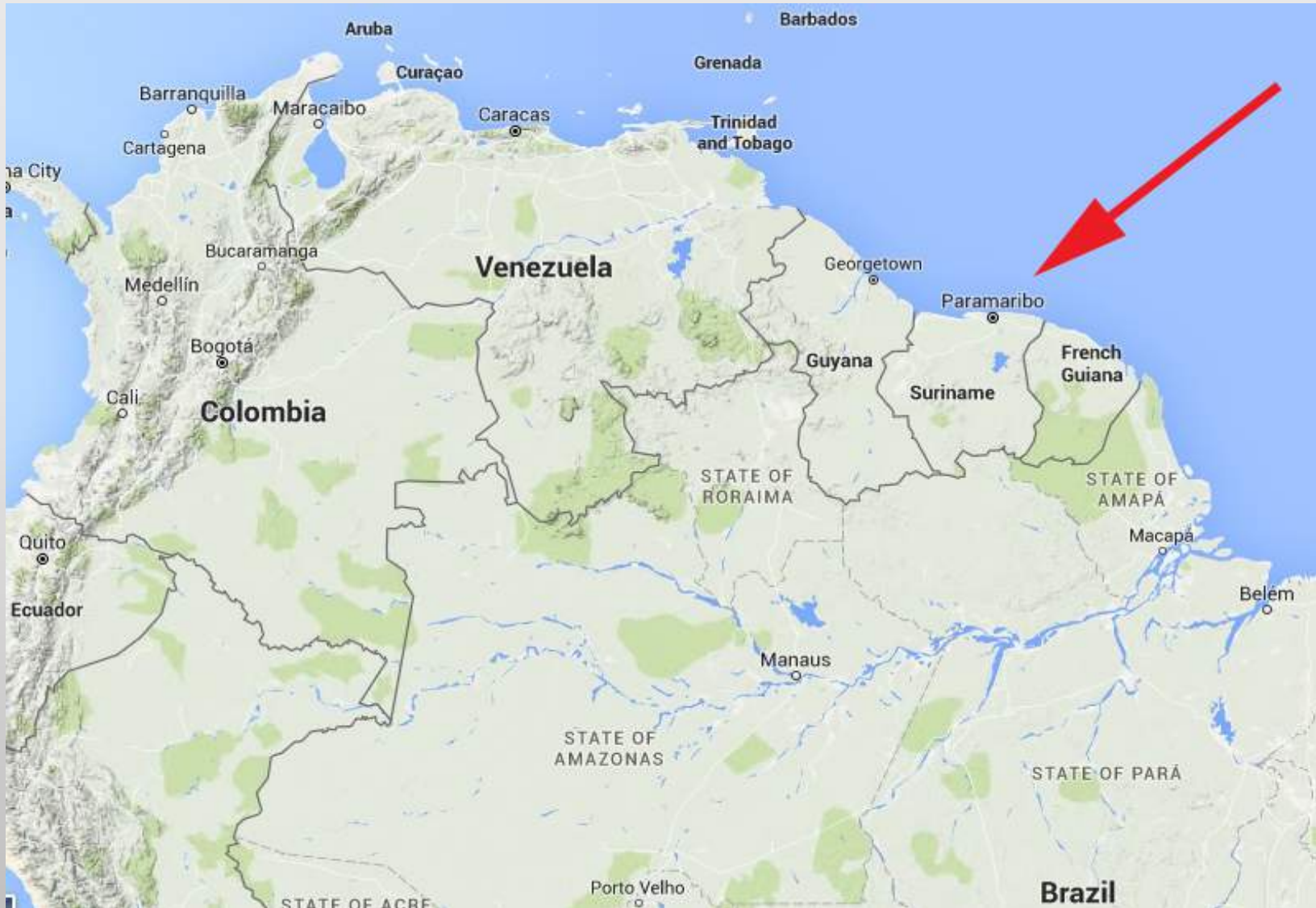
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# Presentation objectives

- Describe the vulnerable population
- Characterize the flood
- Discuss health system response action
- Examine sustainable adaptation strategies

# Suriname



- A country situated on the northeastern coast of South America
- More than 80% of the population lives in the coastal area
- The hinterland is primarily inhabited by tribal and indigenous peoples, living alongside the big rivers in villages and camps, ±50,000 persons
- Health care is offered by the Medical Mission Primary Health Care Suriname
- Small-scale gold mining is on the increase in the hinterland

## Small scale gold mining, Suriname



# Amazon Rainforest of Suriname

The Amazon rainforest of Suriname, is primarily inhabited by tribal and indigenous people facing a triple health threat of disparities, climate change, ecosystem contamination:

- **Disparities** are due to:
  - Reduced access to basic commodities such as safe water and electricity
  - Limited access to health care and social services
  - Lower educational attainment
  - Higher malnutrition
  - Geographic isolation which restricts their opportunities to participate in policymaking
- **Climate change**
  - Each of the ecosystem services (food, water and other resources) are sensitive to climate and will therefore be affected by anthropogenic climate change.
- **Ecosystem contamination**
  - Mercury (Hg) pollution is the most serious ecosystem contamination in Suriname

# Flooding in the Amazon rainforest of Suriname



- ❑ In the last week of April and the first week of May 2006, heavy and sustained rainfall in a wide area including the central, south and south-east mountain ranges of Suriname
- ❑ Affected 13,000 households in the eastern interior of Suriname
- ❑ 31,698 people were severely affected by the flood
- ❑ Affected areas were publicly announced 'Disaster Areas' by the President of Suriname on May, 8<sup>th</sup>, 2006.

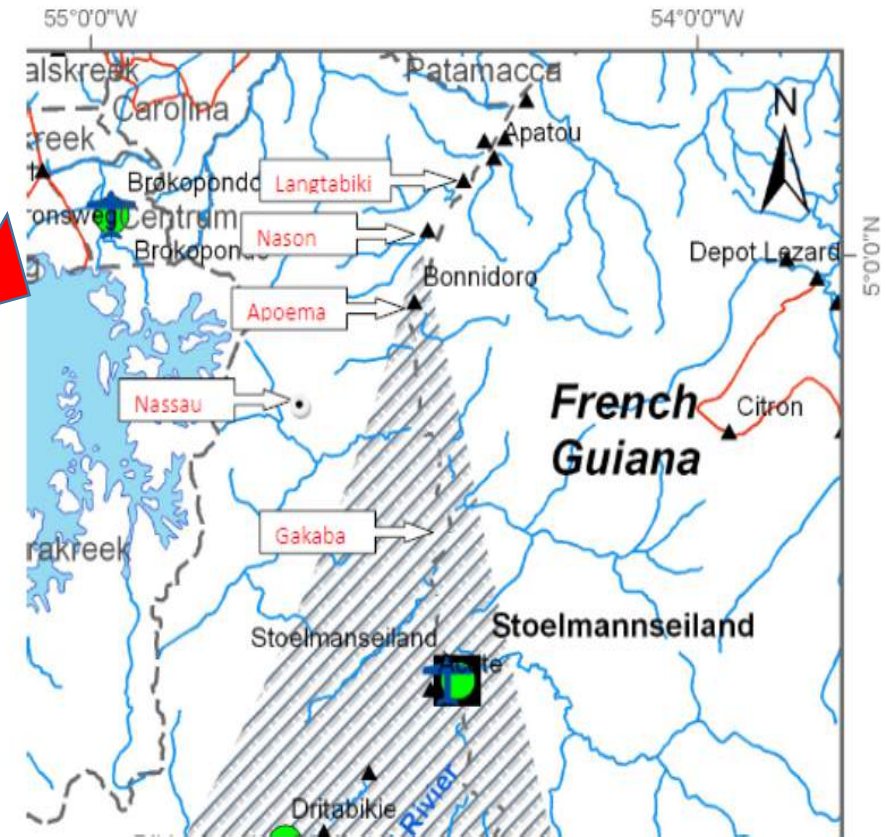
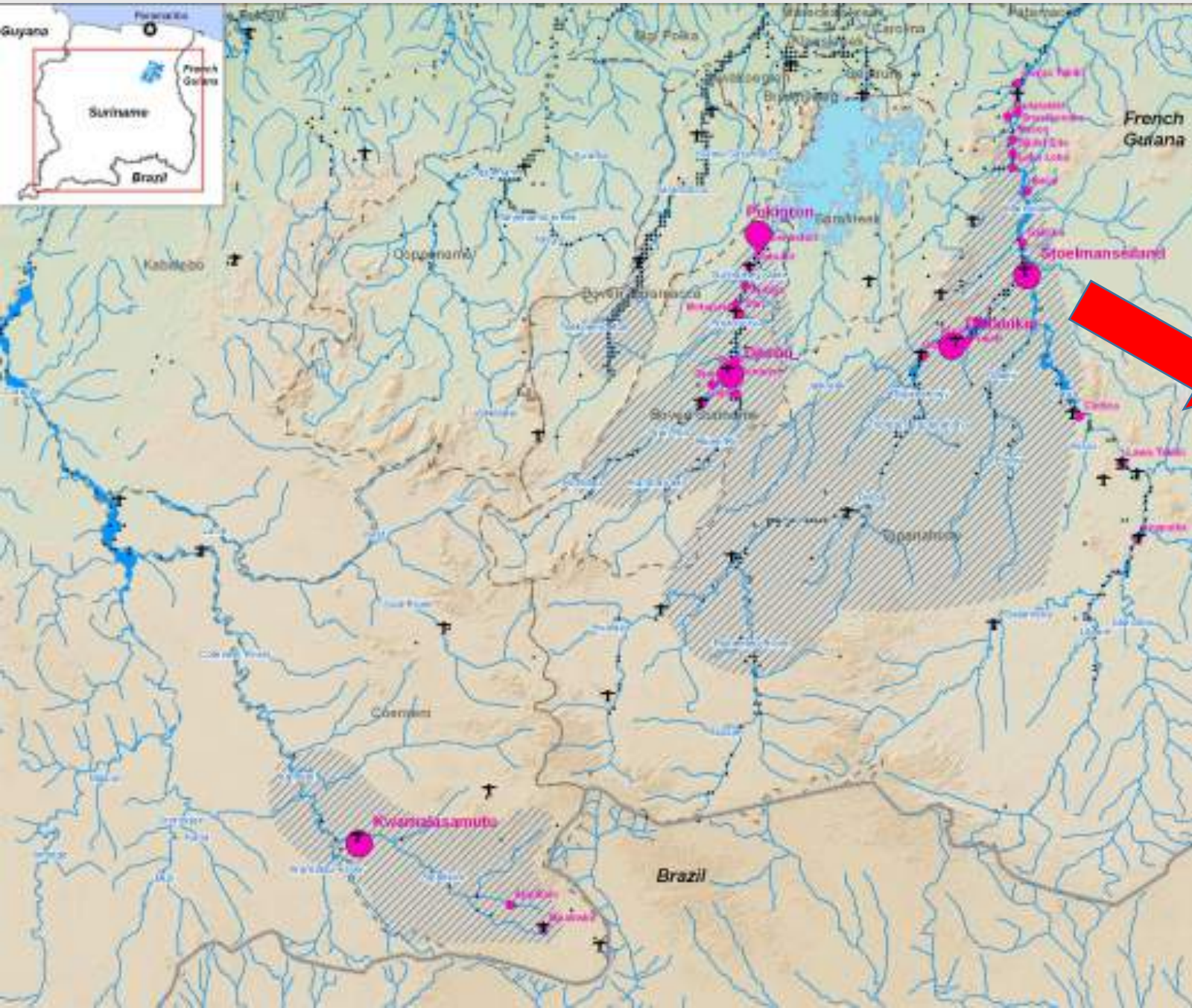


## Flooded villages



*Pictures: International Red Cross*

# Affected areas in the May 2006 flooding



# Method Case study

- The Primary Health Care system of the Medical Mission is a good organized system consisting of 50 health clinics, scattered over the rural and forested hinterland, which are placed at concentration of inhabitants, with a focus on accessibility.
- Diagnosis of every person who present oneself at one of the health centers or outpatient clinics of the Medical Mission are based on standard Medical Mission protocols.
- Surveillance data are collected weekly by the trained Medical Mission health-care assistants.

# Method Case study (cont'd)

- Actions of Medical Mission during and after the flooding:
  - ❑ continued surveillance, with reporting frequency increased;
  - ❑ Increased alertness on accidents;
  - ❑ Intensified distribution of essential resources such as ORS, drinking water and drugs.
- The ECLAC (Economic Commission for Latin America and the Caribbean) team visited Suriname in September and November 2006 for a damage assessment report using the Sustainable Livelihoods Approach (SLA) to analyze the impact of the floods on the affected households.

# Impact of the flood

## *Expectations:*

- Transmission of water-borne diseases
  - typhoid fever
  - cholera
  - leptospirosis
  - hepatitis A
- Transmission of vector-borne diseases
  - malaria
  - dengue
  - dengue hemorrhagic fever
  - yellow fever
  - West Nile Fever
- Secondary health threats such as diarrhea epidemic, especially among children

## *Reality:*

- The overall value of damage and losses ± US\$41 million.
- Most losses were to self subsistence agriculture.
- Diarrheal disease had only a small uptick.
- Malaria decreased tremendously following the flood.

Surveillance data of Diarrhea and malaria

Diarrhea	Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
	Clinic:													
	APOEMA	301	234	241	375	272	281	272	246	222	230	208	128	114
	GAKABA	231	181	117	320	214	220	261	185	214	215	179	135	137
	LANGA-TABIKI	196	169	228	381	209	180	209	94	178	119	100	73	78
	NASON	99	65	63	82	316	346	441	436	445	364	206	195	241
	NASSAU	----	----	----	10	18	25	26	----	----	----	----	----	----
	STOELMANS EILAND	177	138	344	428	433	398	366	173	183	204	172	170	214
	Total	1004	787	993	1596	1462	1450	1575	1134	1242	1132	865	701	784
		Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Malaria	Clinic:													
	APOEMA	----	----	----	1007	679	746	164	19	39	17	4	2	
	GAKABA	----	----	----	827	679	894	263	61	21	11	1	1	1
	LANGA-TABIKI	----	----	----	823	319	360	84	21	53	13	3	1	5
	NASON	----	----	----	481	236	210	37	2	9	6	----	----	----
	NASSAU	----	----	----	4	19	28	26	3		1	----	----	----
	STOELMANS EILAND	4181	4839	3771	1254	963	828	273	13	37	10	5	9	1
	Total	4181	4839	3771	4396	2895	3066	847	119	159	58	13	13	7

Table1: number of cases of diarrhea and malaria quantified at the different clinics per year from 2000 - 2012

# Graphs of cases of diarrhea and malaria quantified at the different clinics per year from 2003 - 2012

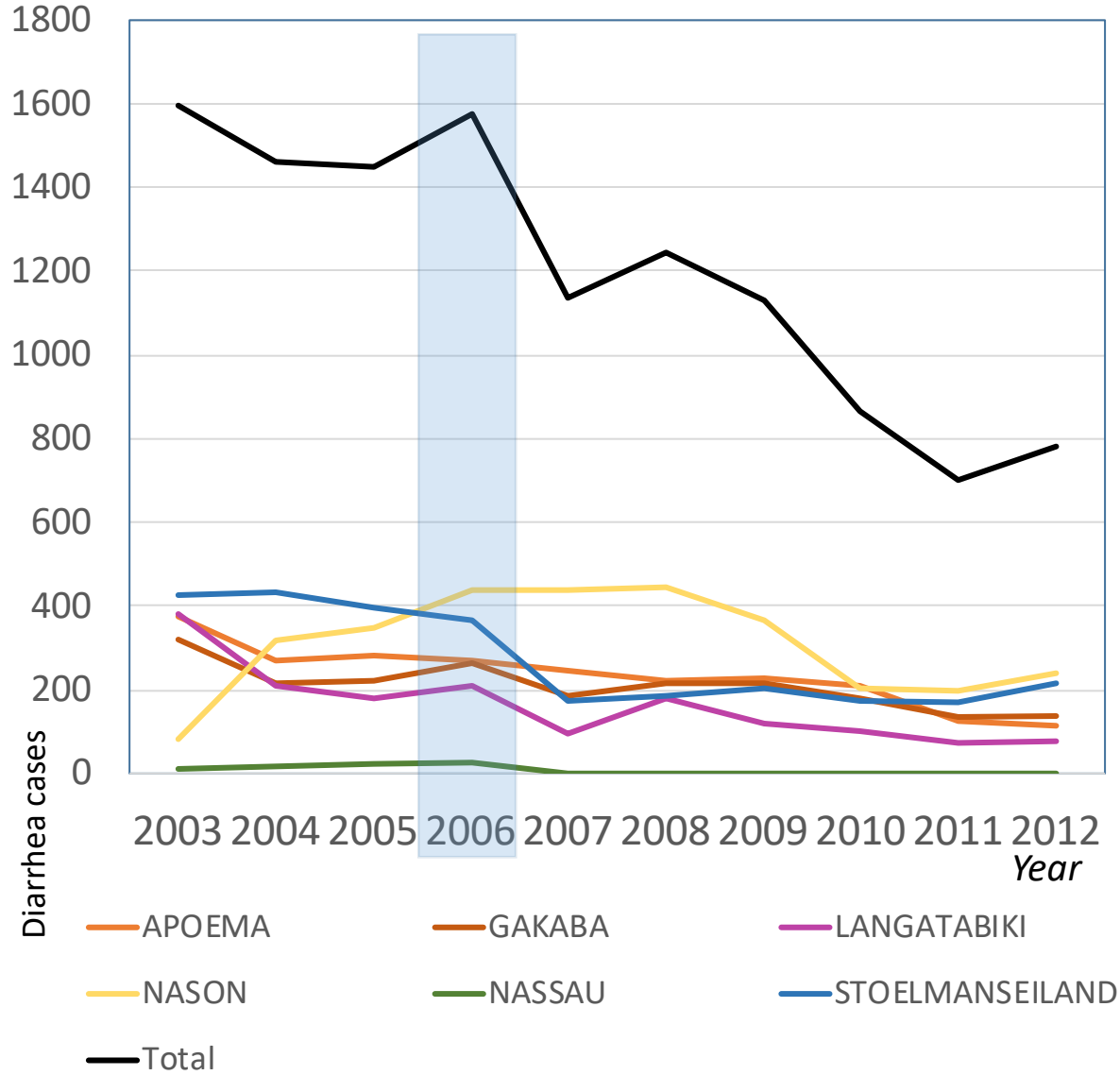


Figure 2: Diarrhea before/after flooding per year

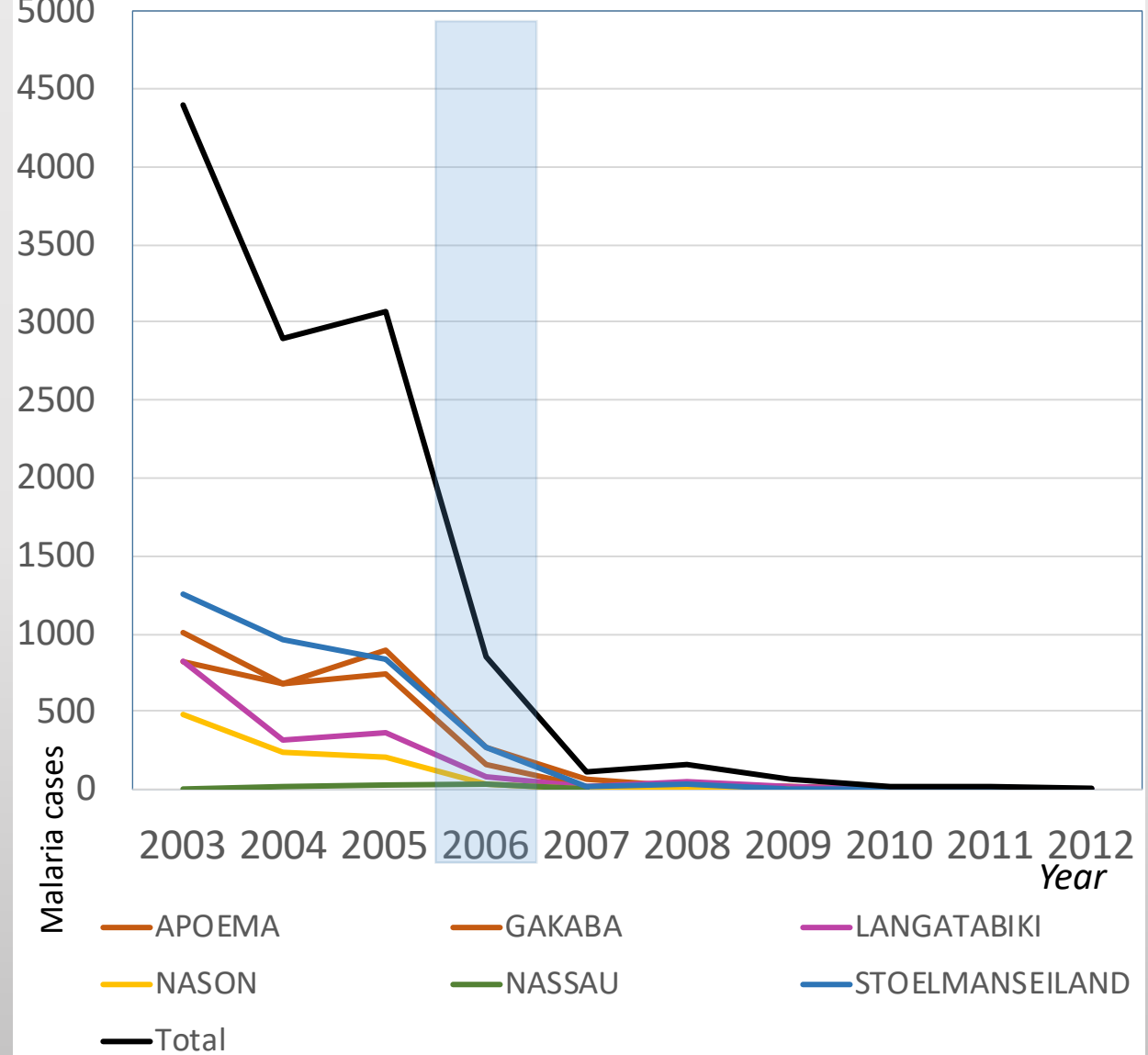


Figure 3: Malaria before/after flooding per year

# Discussion

- Diarrheal disease had only a small uptick:
  - This could be the result of good PHC services and monitoring and the benefits of continued access to high quality primary care.
- Malaria decreased tremendously following the flood:
  - Malaria breeding places were possibly flushed out by the flood;
  - The decline in malaria cases coincide with the implementation of major malaria prevention and control interventions.
- In the aftermath of the floods, many families relocated agricultural plots to less fertile land inwards and diversified income sources through employment in Hg-enabled goldmining operations.
  - Both strategies have adverse long-term implications for ecosystem and human health.



# Discussion (cont'd)

- This case study of the 2006 floods in Suriname thus demonstrates the importance of examining critical trade-offs in household adaptation strategies in response to flooding.
- Since climate change is expected to increase the variability and intensity of flood regimes across the Amazon, it is urgent to examine factors influencing sustained community resilience to extreme hydrological events is urgent.

# Conclusions

## Lessons learned:

- Flooded agricultural plots have been moved to higher but less fertile areas.
- Due to reduced employment, many drawn to the gold fields in Hg-enabled gold mining operations to look for employment resulting in increased Hg pollution.
- Short- and long-term coping strategies include reliance on traditional social networks.
- Urgency of examining factors influencing sustained community flexibility to extreme hydrological events.

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Thank you