Climate Change and Health: Linkage between rate and distribution of some major infectious diseases and climate variabilities & change in Vietnam

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Rationale & background

- In Vietnam & other developing countries, CC was not properly integrated into health policy, strategy and planning process;

- So far there was no quantitative study providing reliable scientific evidences on the impacts of climate change / climate variabilities to public health in Vietnam

- This study attempts to provide such evidences through analysis in geographical and temporal changing pattern of major infectious diseases in different regions and provinces of Vietnam

Main pathways and possible health effects of climate change globally

(Source: Patz JA et al. 2000)
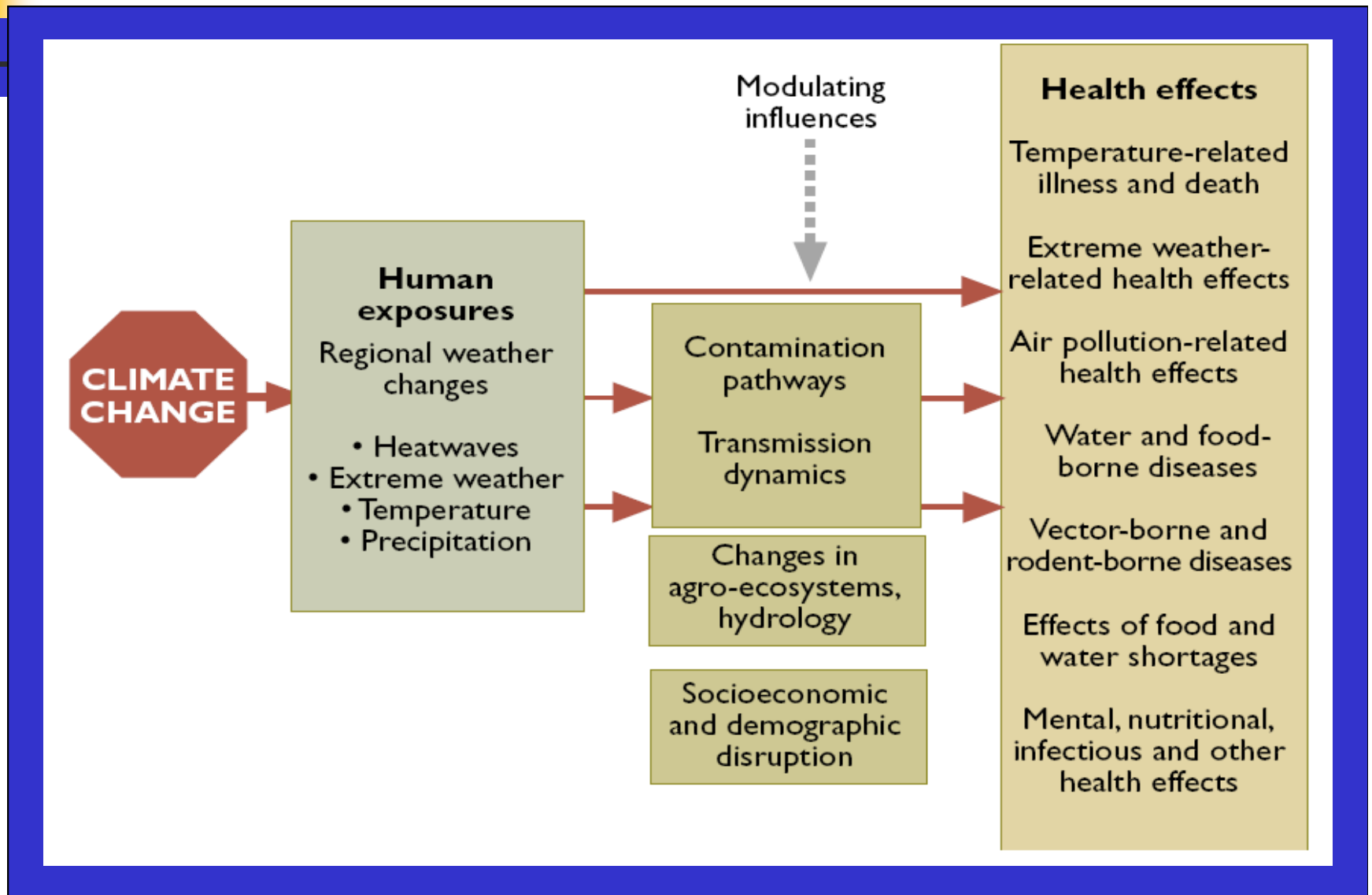
Objectives & Data set

Research objectives:

- Identify the quantitative and qualitative evidences of the linkage and correlation between major climate-sensitive infectious diseases (rate and spatial distribution) and climate variability and change in Vietnam;

- Preliminary analysis of governance & policy systems for health, climate and disaster sectors in Vietnam to identify the main gaps and propose recommendations

Data set:

- Climate data (time series) from 61 stations representing 61 provinces in Vietnam (1975 to 2004)

- Epidemiologic data 1979 to 2003 or 2005 on disease rate, cases, Morbidity and Mortality of main Water-Born and Vector-Born Diseases.

- Oceanic Niño Index (ONI) in the Niño 3.4 region of the Pacific
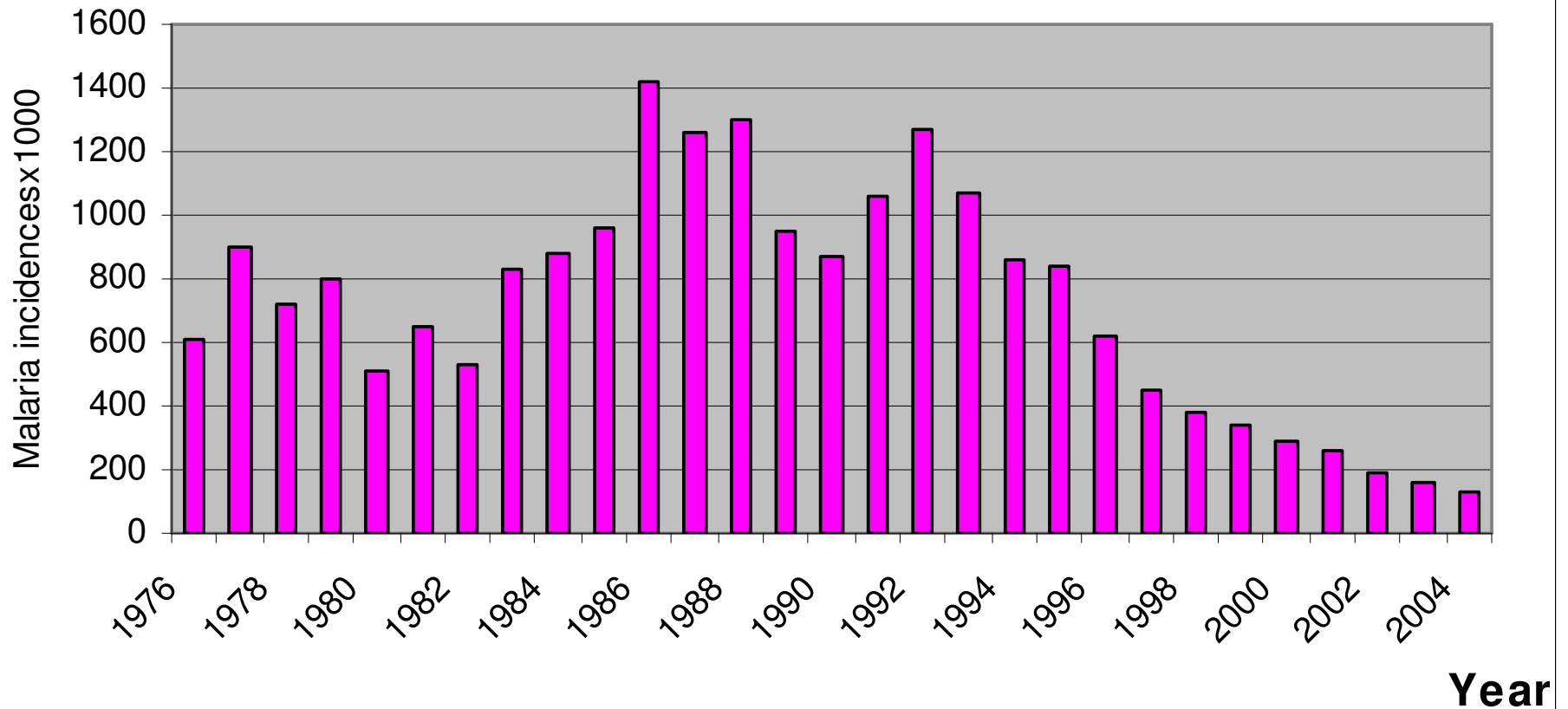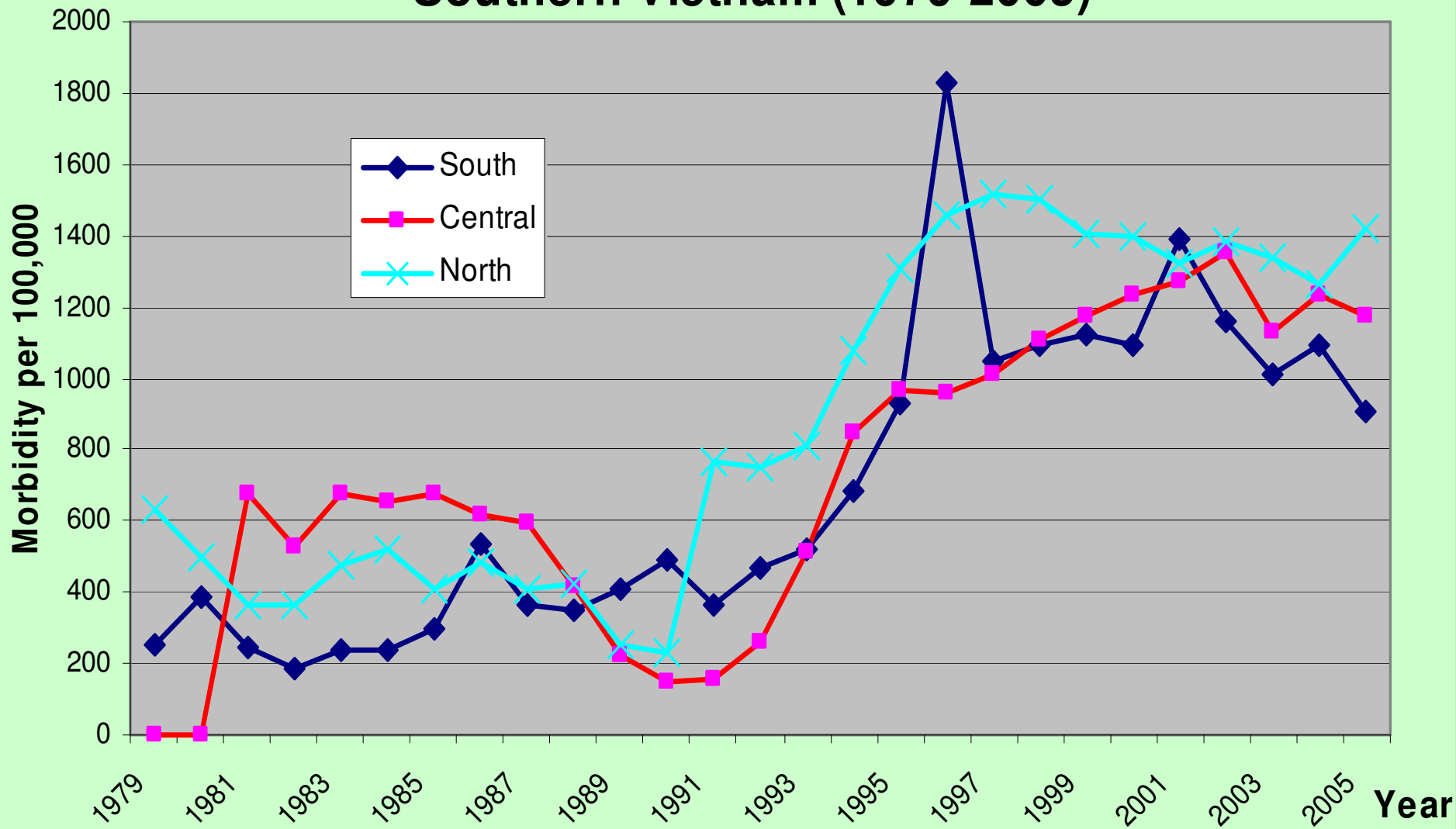
Methodology

- Time-series and statistical analysis, linear and/or non-linear regression, using Statistical Package for Social Scientist (SPSS);
- Spatial analysis, using GIS tools
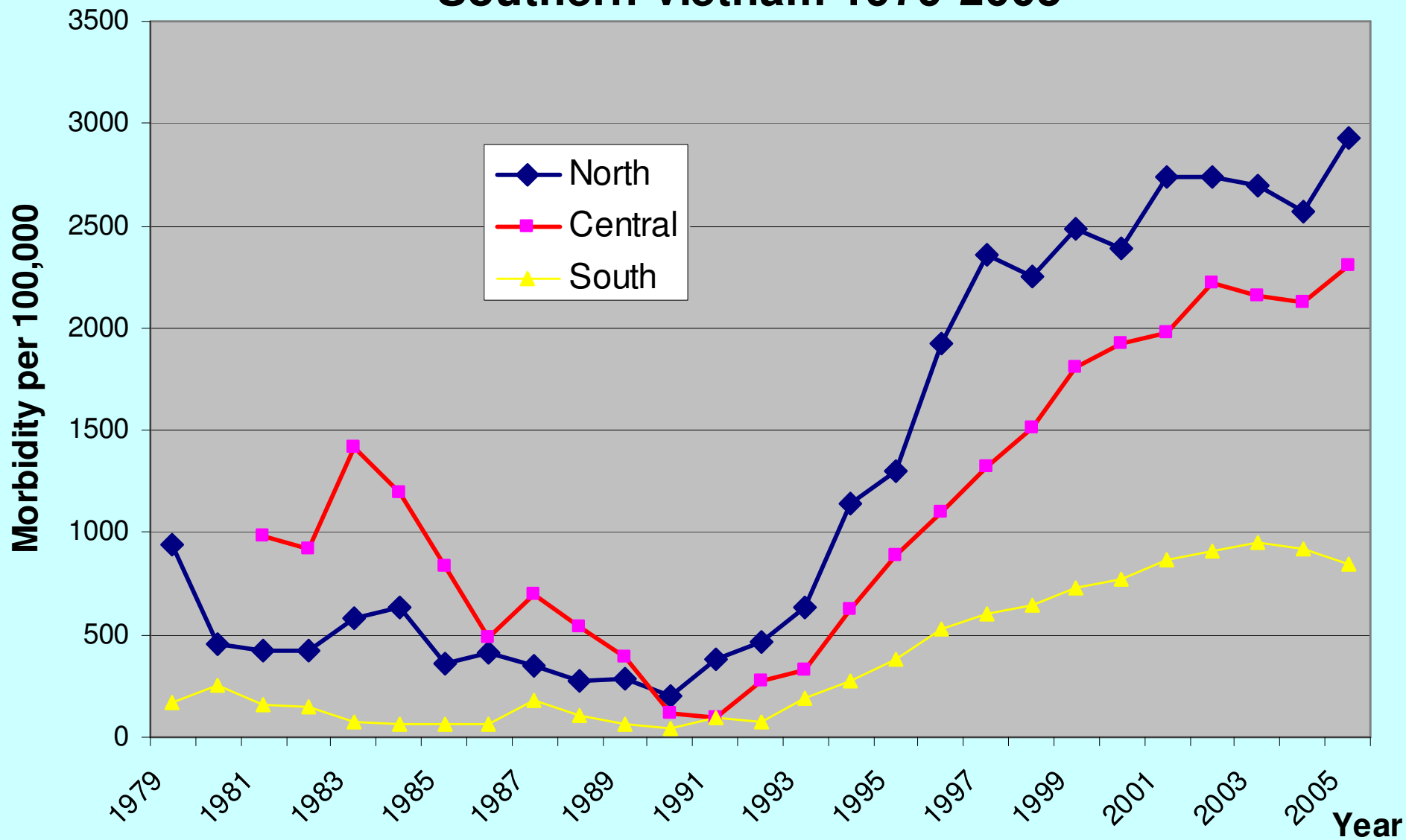
Key vector-born disease: Malaria

Number of Malaria incidences in Vietnam 1976- 2004

Morbidity of Diarrhorea in Northern, Central and Southern Vietnam (1979-2005)

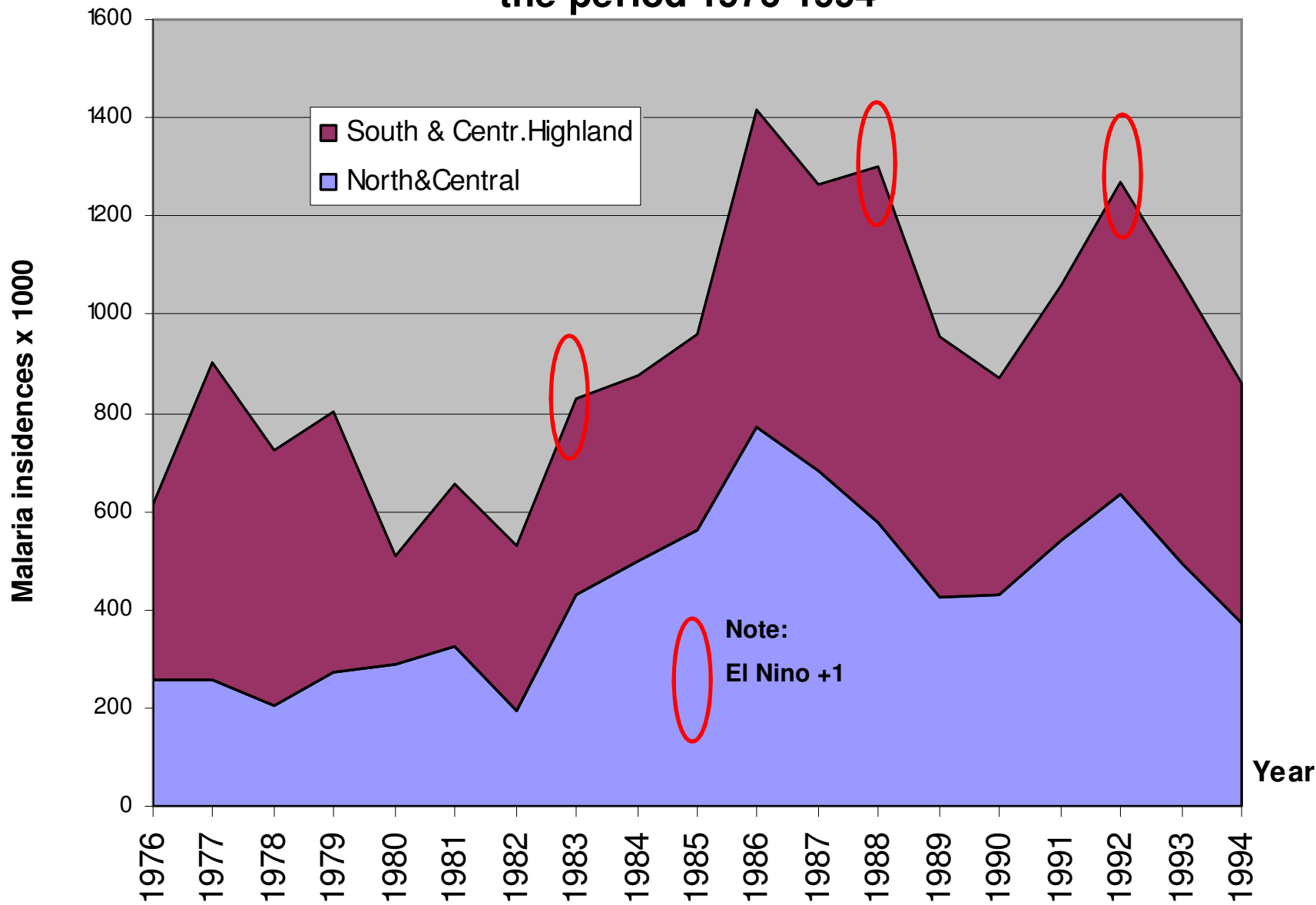**Morbidity of Flu in 3 regions: Northern, Central and Southern Vietnam 1979-2005**
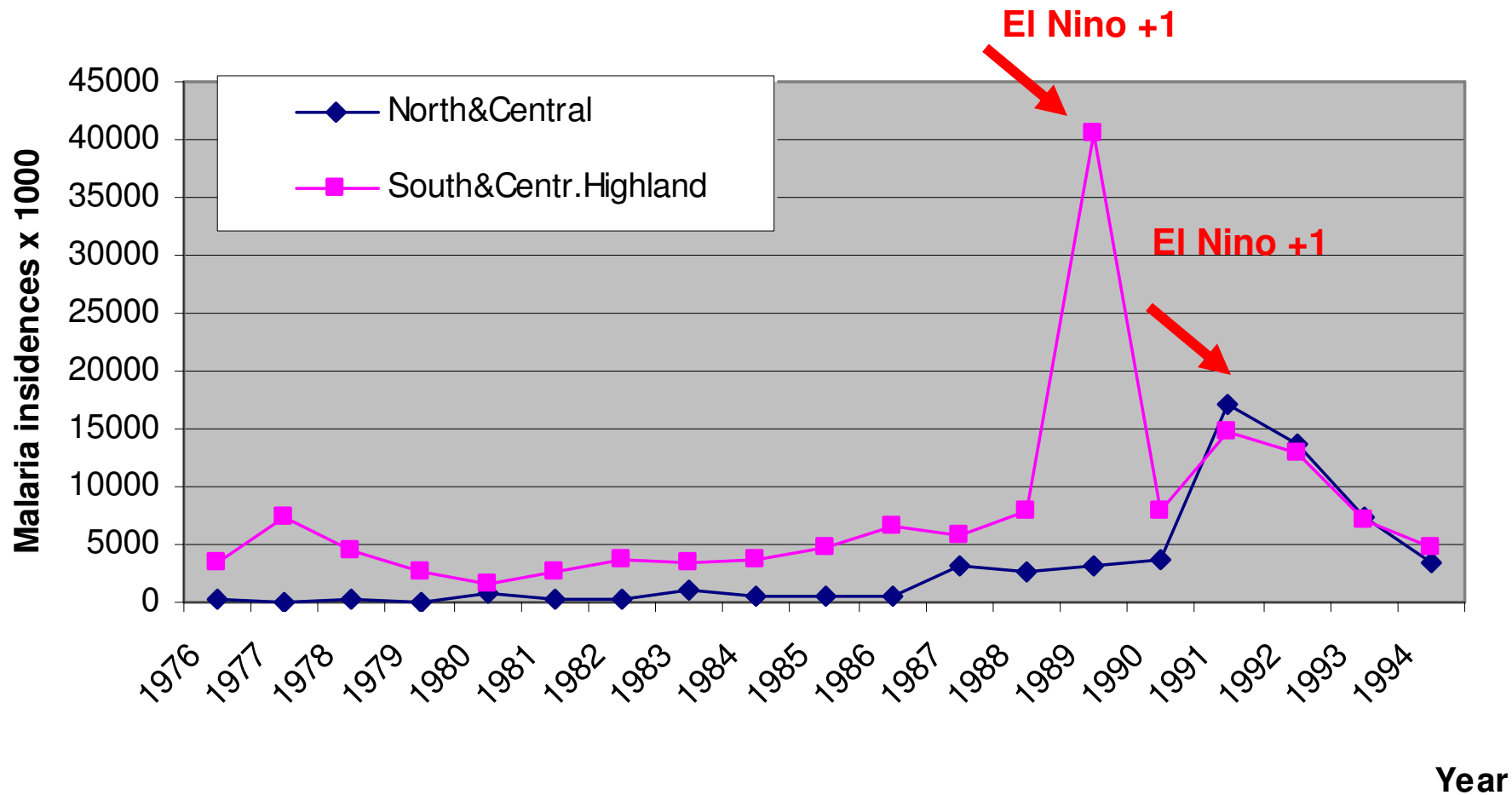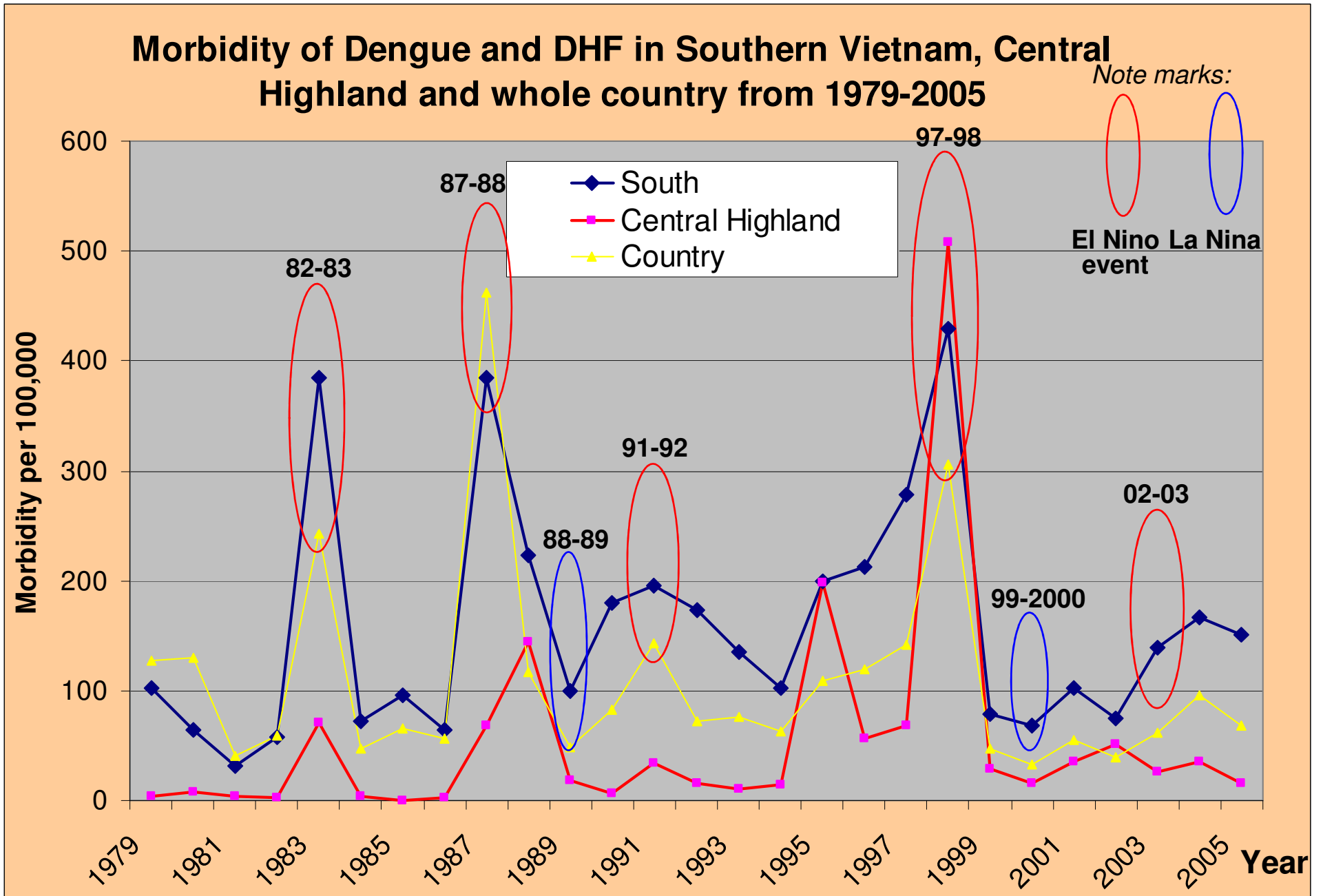
Morbidity per 100,000

- North
- Central
- South

Year

Coincidence of Malaria and El Nino events in Vietnam in the period 1976-1994

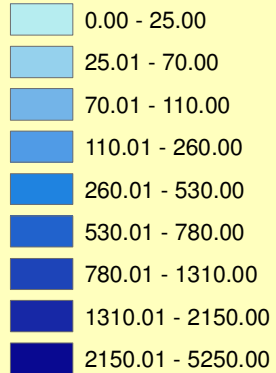Number of Acute Malaria casces in Vietnam 1976-1994

Co-incidence of Dengue rate break out/ decreases and El Nino/ La Nina events

Spatial Distribution of Malaria Morbidity (per 100,000 inhabitants) in Vietnam:

2001-2005

Legend:

Morbidity_of_VN
MALARIA_01

- 0.00 - 25.00
- 25.01 - 70.00
- 70.01 - 110.00
- 110.01 - 260.00
- 260.01 - 530.00
- 530.01 - 780.00
- 780.01 - 1310.00
- 1310.01 - 2150.00
- 2150.01 - 5250.00

0 55 110   220   330   440
Kilometers

Legend:

Morbidity_of_VN
MALARIA_03

- 0.00 - 25.00
- 25.01 - 70.00
- 70.01 - 110.00
- 110.01 - 260.00
- 260.01 - 530.00
- 530.01 - 780.00
- 780.01 - 1310.00
- 1310.01 - 2150.00
- 2150.01 - 5250.00
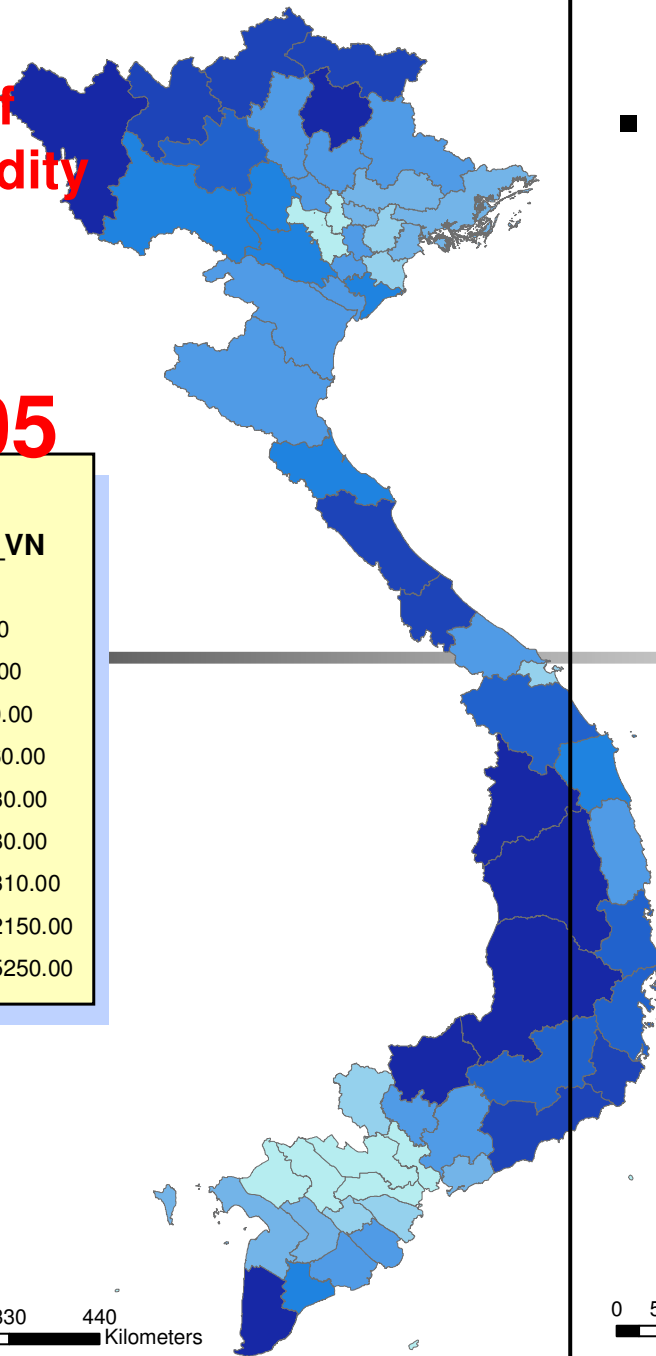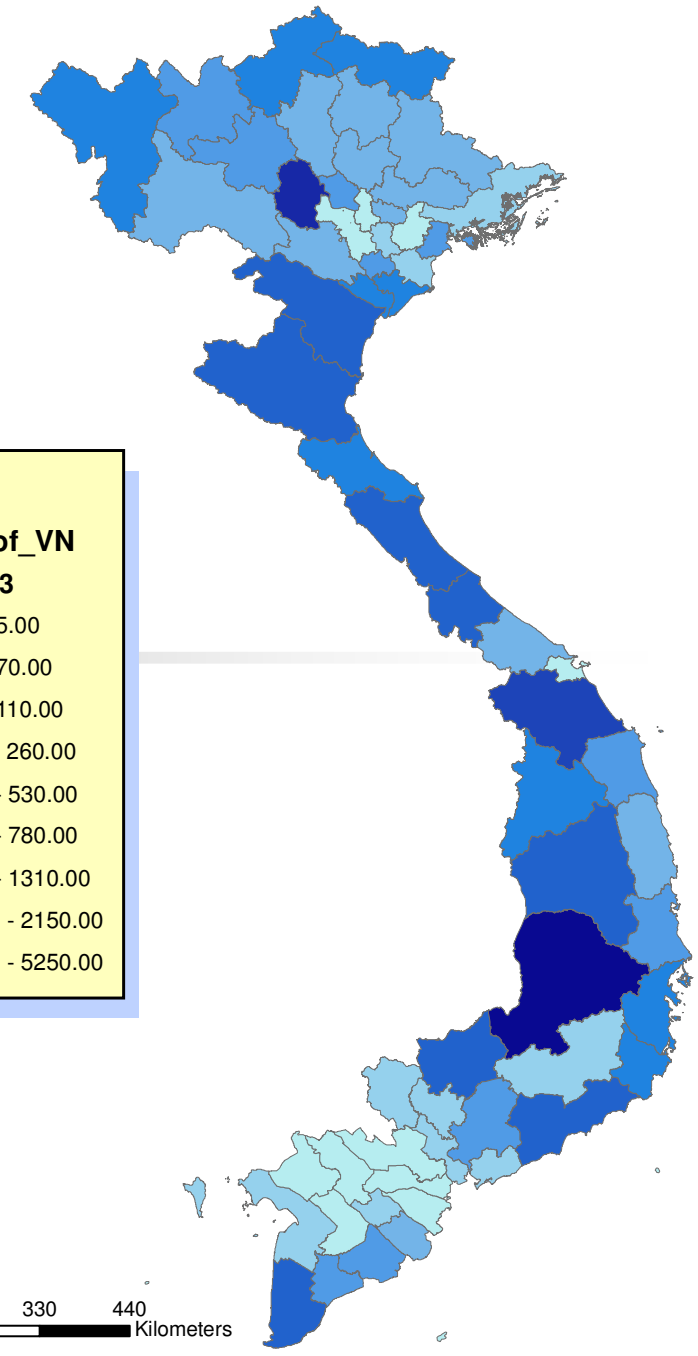
0 55 110   220   330   440
Kilometers

Distribution of Dengue & DHF morbidity (per 100,000 inhabitants) in Vietnam - 1998
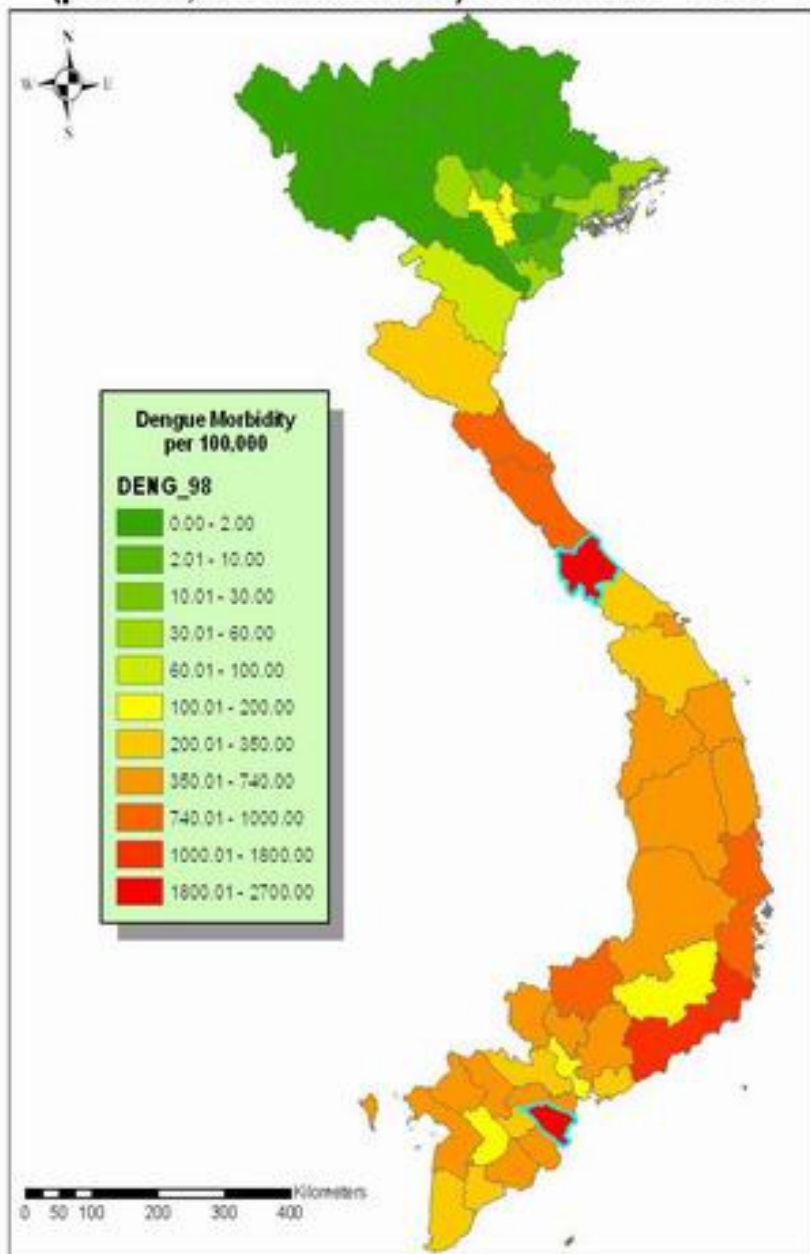
Dengue Morbidity per 100,000

DENG_98
- 0.00 - 2.00
- 2.01 - 10.00
- 10.01 - 30.00
- 30.01 - 60.00
- 60.01 - 100.00
- 100.01 - 200.00
- 200.01 - 350.00
- 350.01 - 740.00
- 740.01 - 1000.00
- 1000.01 - 1800.00
- 1800.01 - 2700.00
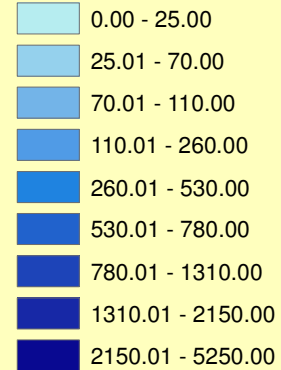
Distribution of Dengue & DHF morbidity (per 100,000 inhabitants) in Vietnam - 2005

Dengue Morbidity per 100,000

DENGUE_05
- 0-2
- 2.1-10
- 10.1-30
- 30.1-60
- 60.1-100
- 100.1-200
- 200.1-350
- 350.1-740
- 740.1-1000
- 1000.1-1800
- 1800.1-2700

Distribution of Dysenterial syndrom morbidity (per 100,000 inhabitants) in Vietnam - 1997

Dysenteria Morbidity per 100,000

DYSENT_97

0 - 40
41 - 100
101 - 195
196 - 270
271 - 380
381 - 530
531 - 750
751 - 1360

Distribution of Dysenterial syndrom morbidity (per 100,000 inhabitants) in Vietnam - 2005

Dysenteria Morbidity per 100,000

DYSENT_05

0.00 - 40.00
40.01 - 100.00
100.01 - 195.00
195.01 - 270.00
270.01 - 380.00
380.01 - 530.00
530.01 - 750.00
750.01 - 1360.00
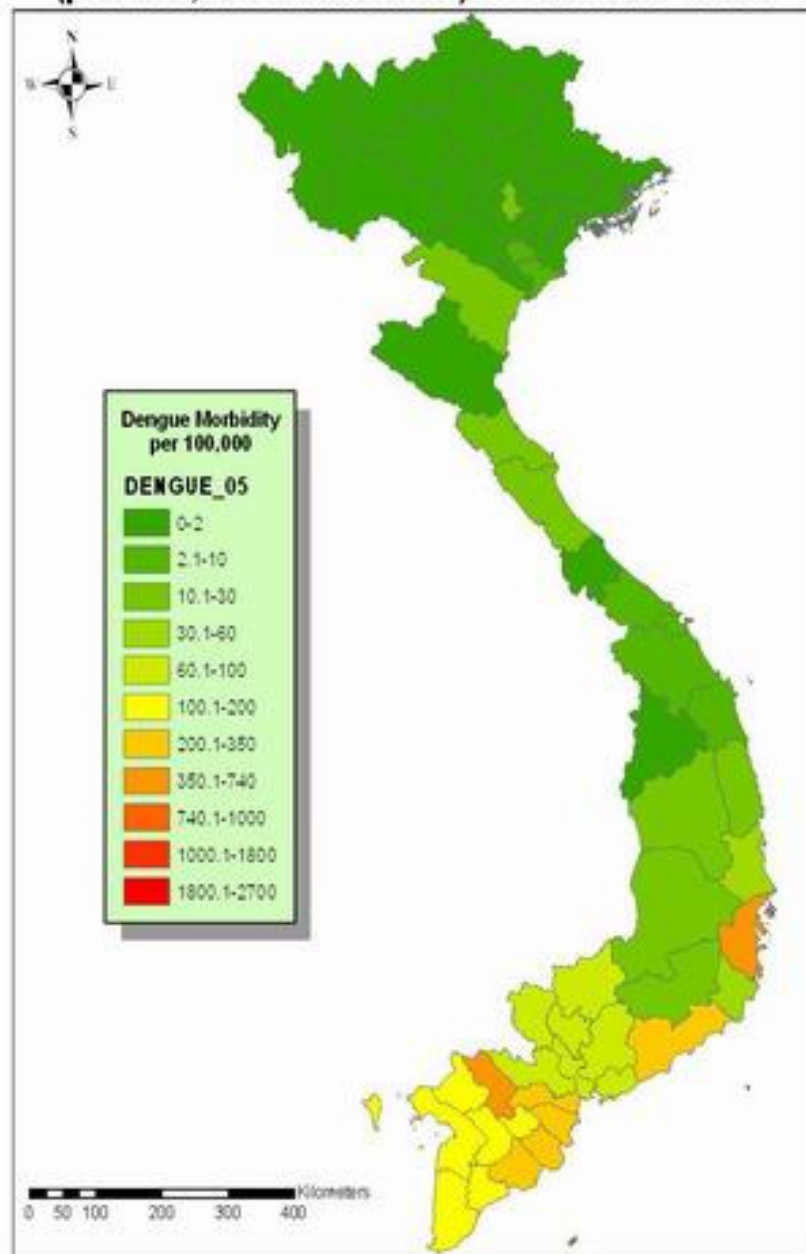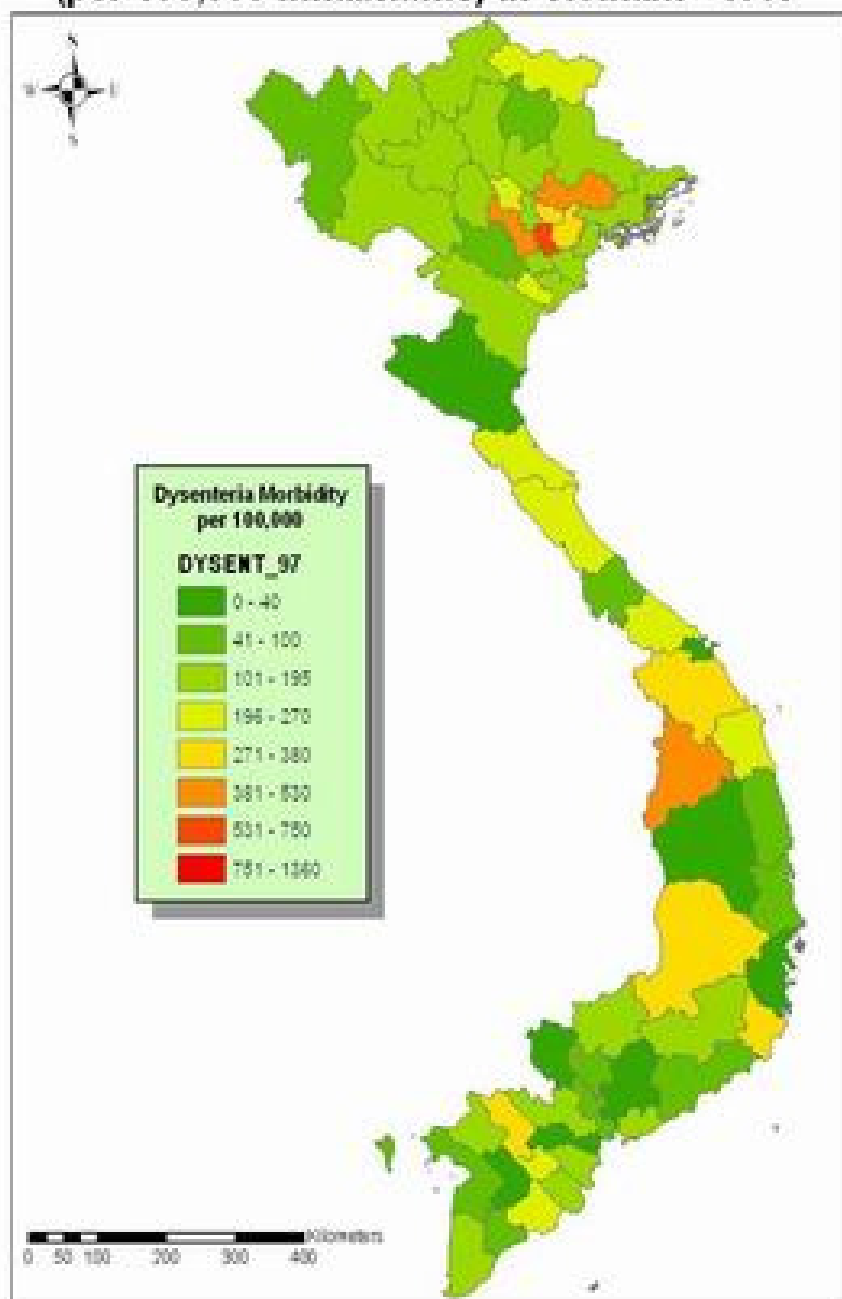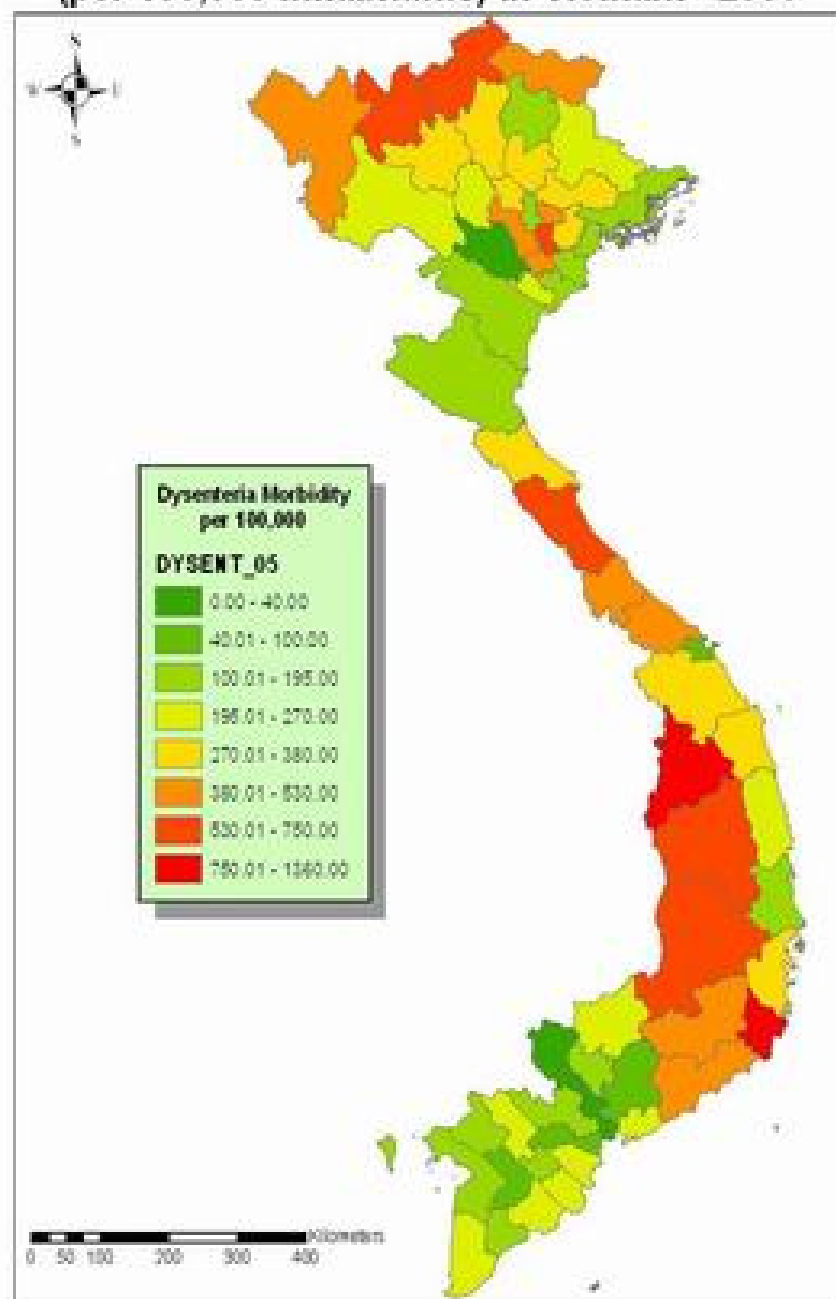
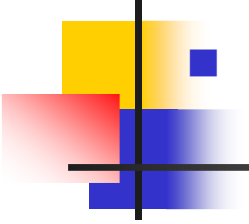# Non-linear correlation of DF/DHF in Central Vietnam and the ONI

Dengue Central
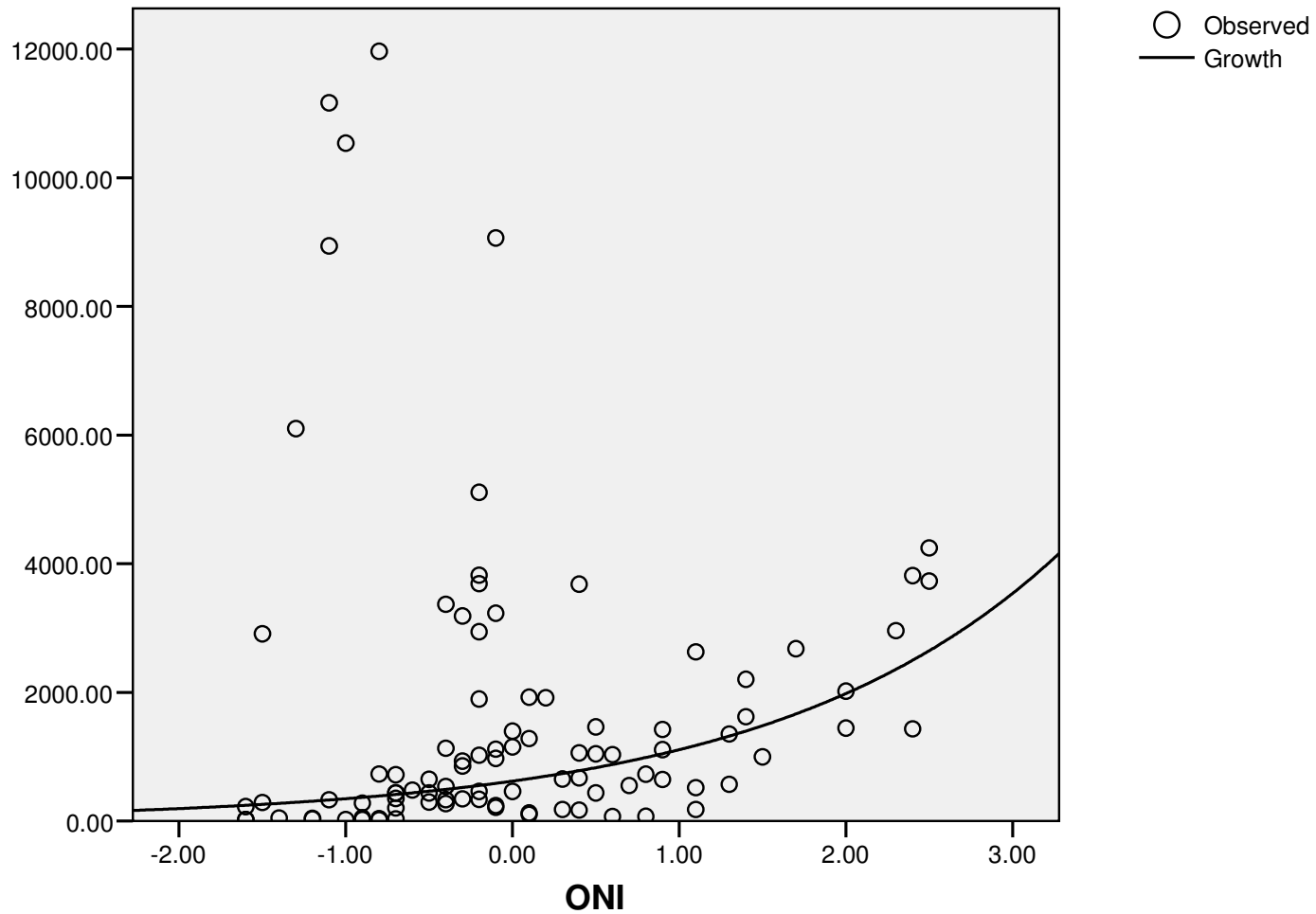
Climate factors & El Nino to the rate of Diarreal Diseases and Dysentery in some provinces of Vietnam

Disease and province of concern	ONI		Temperature		Rainfall	
	Model and % of influence	Significancy	Model and % of influence	Significancy	Model and % of influence	Significancy
Diarreal Diseases in Thua Thien Hue	Cubic 23.9%	High p<0.000	Linear 4.9%	High to-Medium P<0.031	_____	No
Diarreal Diseases in Danang	Cubic 9.8%	High to-Medium p<0.04	_____	No	Cubic 68.6%	High p<0.000
Dysentery in Thua Thien Hue	_____	No	_____	No	Cubic 11.3%	High p<0.013
Dysentery in Danang	Growth 12.8%	High p<0.01	_____	No	Cubic 23.9%	High p<0.000

Cross-sectoral Policy analysis

- A substantial gap between policy making process and scientific researches in Vietnam

- Limited collaboration between the three sectors: Health, Climate and DRR, and even among institutions of one sector

- Most of health policy makers & staffs have only basic general knowledge about CC but very few really know in depth

- Very few consideration of climate change and adaptation in health policy making

- Health scientists, epidemiologists and doctors use to do research in limited areas & time frame

Inter-linkage between climate change, disasters and health

Climate change
+Climate variabilities
+Shift in seasonal and weather pattern

Environmental change
+Biodiversity loss
+Degradation and pollution

Climate policy: Adaptation & Mitigation

Environmental policy

INTERLINKAGE & INTEGRATION

Disaster management

Health policy & interventions

Disasters:
- Natural disasters: Flood, storms, drought
- Humanity disasters: displacement, population boom, conflicts, war.

Human Health

Results and Conclusions

- **Reliable epidemiological evidence** that climate factors and climate variability associated with disease pattern of major infectious diseases in Vietnam

- Correlation is higher in areas where climate parameters and anomalies are linked with the El Nino cycle

- Correlation are different across diseases: Malaria, Dengue and ADD are correlated stronger with climate
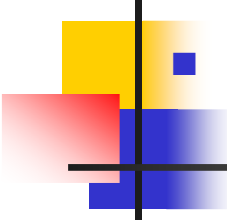
Results and Conclusions (2)

- Water-born diseases rate are clearly higher at poor rural and urban areas **after major floods and storm events**

- High risk of extension of vector-born diseases into marginal areas of currently endemic zones, to higher elevation in North/Northwest mountains, Central Highland & Central Coast

- The correlation differ across regions/ provinces; and

- Disease prevention campaigns / interventions did show positive changes and still play important roles

Adaptation in Health sector

- Adaptation in health sector requires interdisciplinary cooperation: between ministries/institutions; health professionals, climatologists, disaster experts etc.

- Awareness raising and behaviour change are crucial for strengthening adaptive capacity: Knowledge-Attitude-Practice (KAP)

- Effectiveness of primary Health-Care network, Red Cross and other CSO networks and community engagement are crucial for local adaptation practice

- Early warning system (EWS) and preparedness

- Disease control programs based on climate/disaster risks assessment and interventions (E.g. using Mesocyclops)

- Regional collaboration and learning