



Global Fishery Collapse and the Fate of Human Nutrition

Frisk med Fisk utan Risk ?– Sjömatens betydelse för hälsa och miljö

Dr. Chris Golden

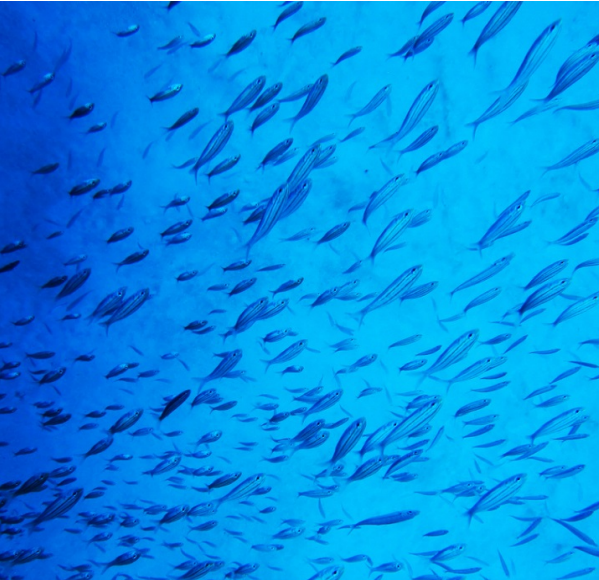
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HARVARD T.H. CHAN
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Environmental Change as Public Health Risk



The Importance of Animal Source Foods



Fish Catch Declines and Micronutrient Nutrition

Environmental Change

- Fisheries stock declines

Changes in Food Supply

- Reduced access to animal-source foods

Changes in Nutrient Intake

- Micronutrient and vitamin intake decreases

Health Impacts

- Increased incidence of micronutrient deficiencies and NCDs

NEWS

The World Is Running Out of Fish Faster Than We Thought

FROM THE NEWS WIRES

Death of coral reefs could devastate nations

As studies predict that vital coral reefs are headed for extinction worldwide, experts say hunger, poverty, and political instability could ensue.

By Brian Skoloff, AP | MARCH 26, 2010

Global warming could cause fishing to decline by millions of tons each year, study says

The San Diego Union-Tribune



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FEATURE STORY

Global Fisheries' Sunken Billions

February 14, 2017



THETIS: Tracking Health and Ecosystem Transformation in the Seas



Planetary Health (PI)

Ecosystem Services

Nutritional Epidemiology

Human Geography

Complex Systems



Climate Impacts

Ocean Health

Fisheries Ecology

Catch Histories

Fisheries Economics

Fisheries Governance

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graph TD; A[Declining Fish Catch] --> B[Alternative Foods]; B --> C[Dietary Change]; C --> D[Nutritional Vulnerability]; D --> E[Aquaculture/Fisheries Management]; E --> A;
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Declining Fish Catch

Alternative Foods

Dietary Change

Nutritional
Vulnerability

Aquaculture/Fisheries
Management

Declining Fish Catch

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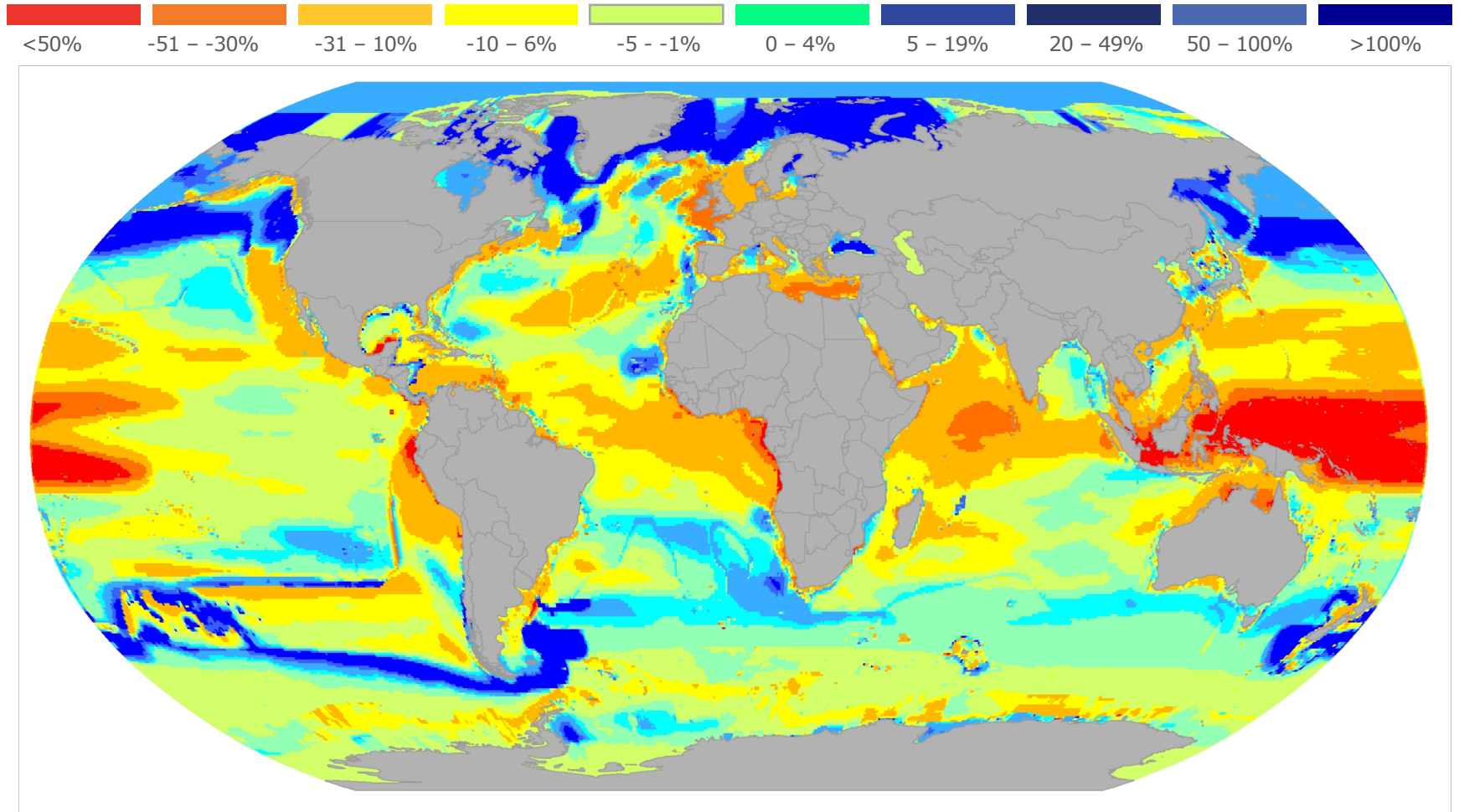
Alternative Foods

Aquaculture/Fisheries Management

Dietary Change

Nutritional Vulnerability

CHANGE IN MAXIMUM FISH CATCH POTENTIAL 2041-2060 relative to 1981 – 2000



Cheung *et al.* update of IPCC (2014) AR5 WGII

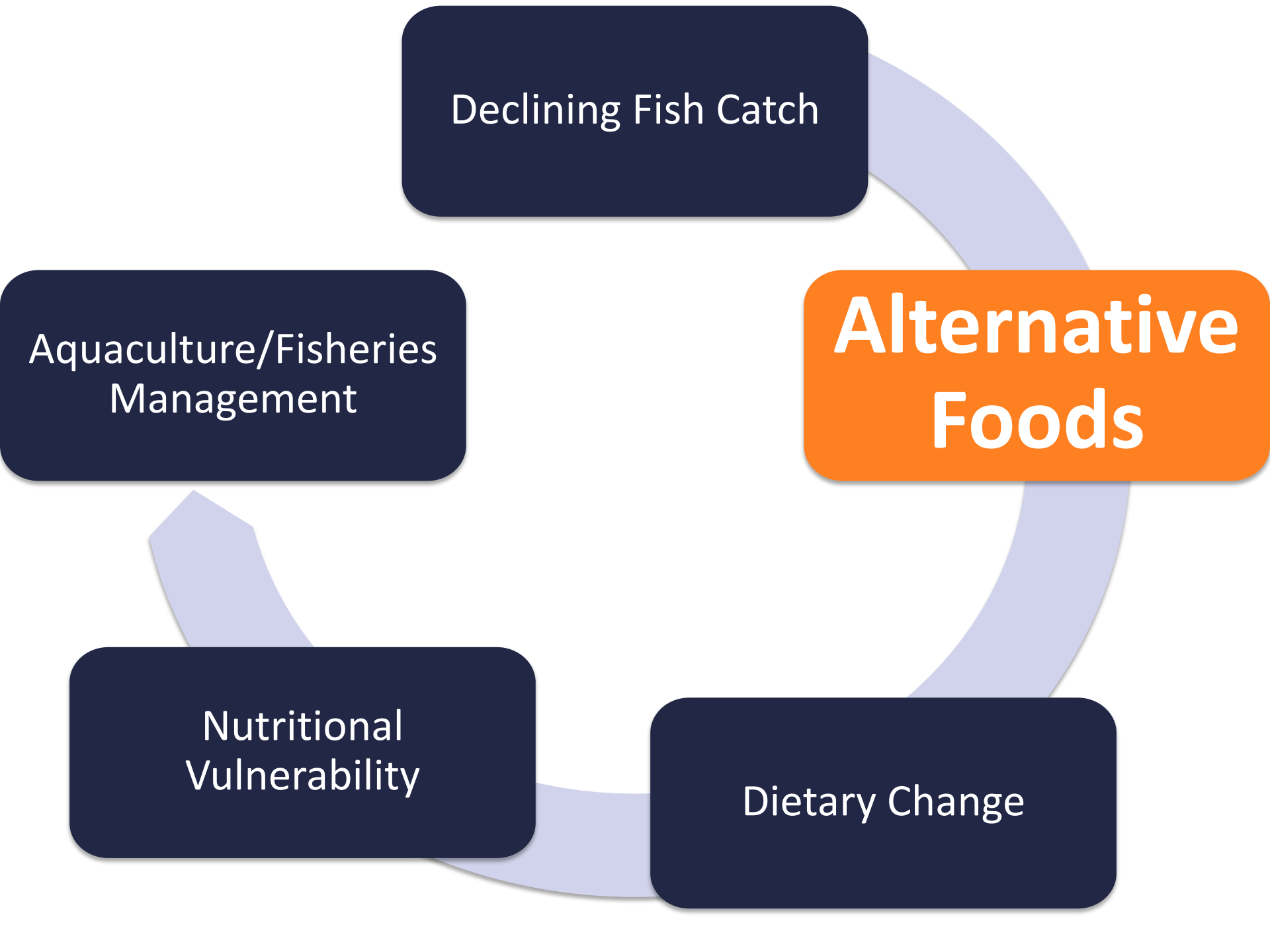
Declining Fish Catch

Aquaculture/Fisheries
Management

**Alternative
Foods**

Nutritional
Vulnerability

Dietary Change



Why Is Fish Nutritionally Important?

KEY NUTRIENTS IN SEAFOOD:



Long chain omega-3 fats

Mainly found in fish and seafood, these fatty acids are essential for optimal brain development.



Iodine

Seafood is in practice the only natural source of this crucial nutrient. Iodine serves several purposes like aiding thyroid function. It is also essential for neurodevelopment.



Vitamin D

Another nutrient crucial for mental development, this vitamin also regulates the immune system function and is essential for bone health.



Iron

During pregnancy, iron intake is crucial so that the mother can produce additional blood for herself and the baby.



Calcium, zinc, other minerals

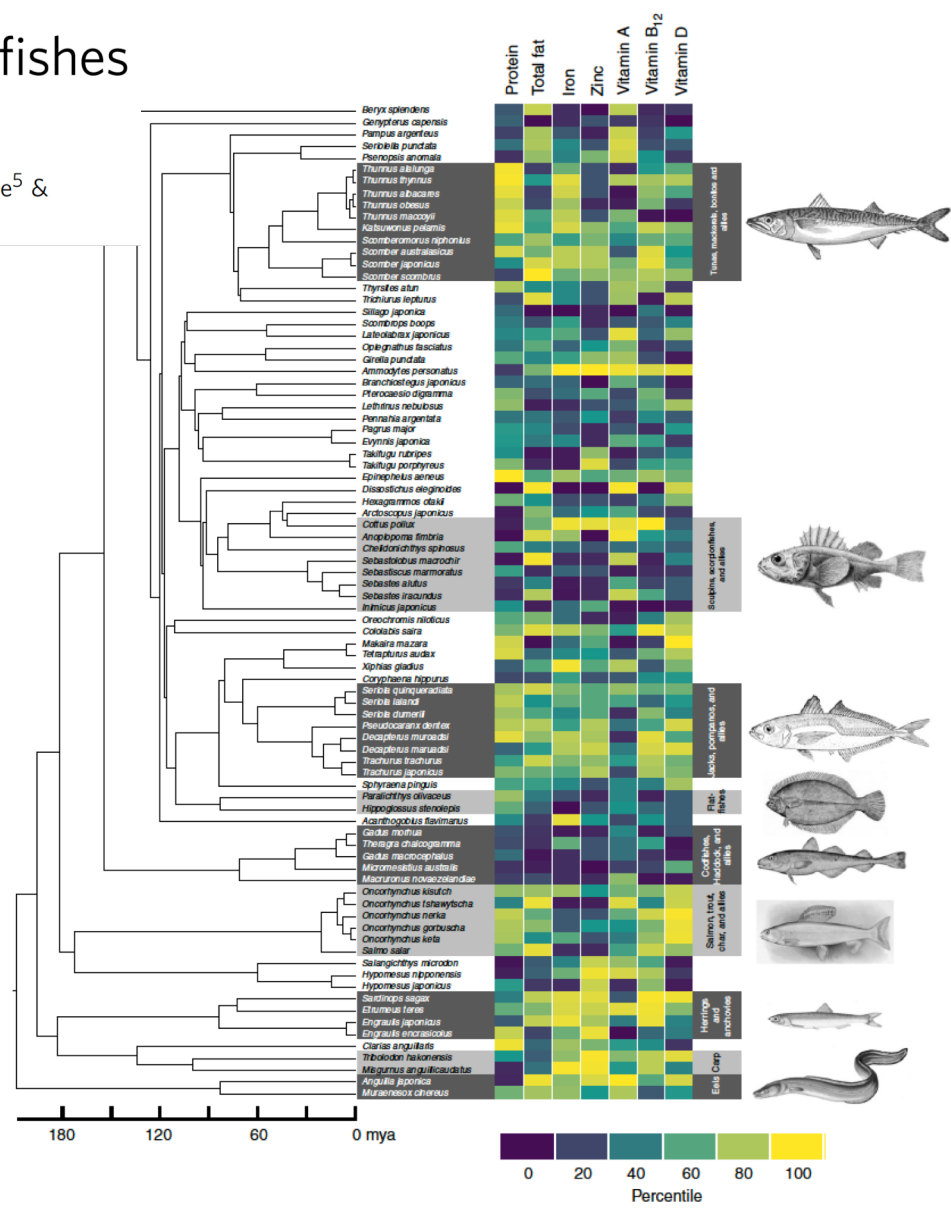
Diets without dairy products often lack calcium, and zinc deficiency slows a child's development.

Predicting nutrient content of ray-finned fishes using phylogenetic information

Bapu Vaitla¹, David Collar^{1,2}, Matthew R. Smith^{1,3}, Samuel S. Myers^{3,4}, Benjamin L. Rice⁵ & Christopher D. Golden^{1,3}

Nutrient	Source threshold (/100g)	Rich source threshold
Protein	7.65 g	15.3 g
Iron	1.95 mg	3.9 mg
Zinc	1.425 mg	2.85 mg
Vitamin A	120 mcg	240 mcg
Vitamin B12	0.75 mcg	1.5 mcg
Vitamin D	0.36 mcg	0.72 mcg

Summary	Protein	Iron	Zinc	Vitamin A	Vitamin B12
Valid species, n	372	345	178	143	122
# Source	17	33	15	7	15
# Rich Source	348	11	10	7	99
# Source or Rich Source	365	44	25	14	114
% Source	4.57	9.57	8.43	4.90	12.30
% Rich Source	93.55	3.19	5.62	4.90	81.15
% Source or Rich Source	98.12	12.75	14.04	9.79	93.44



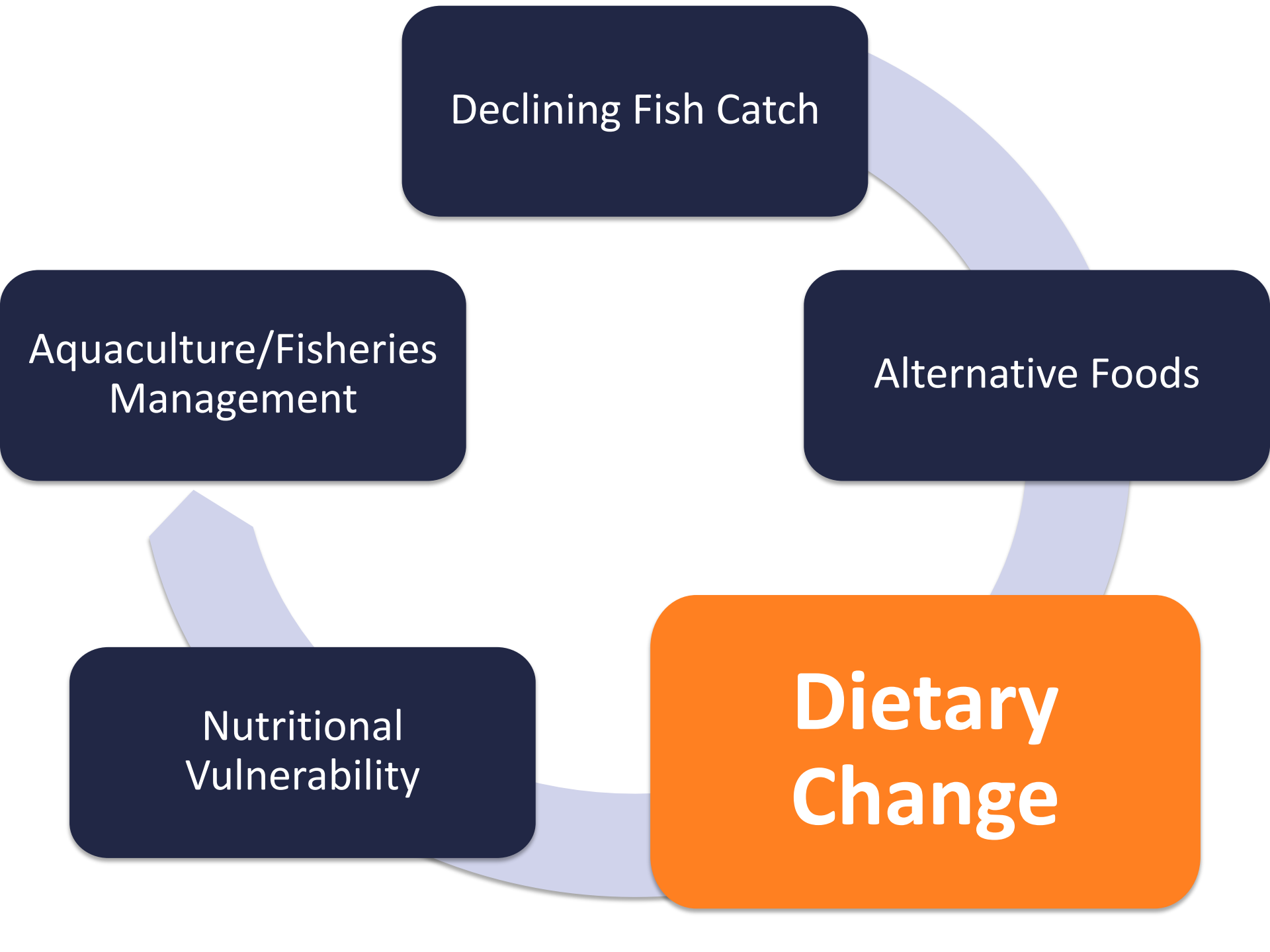
Declining Fish Catch

Aquaculture/Fisheries
Management

Alternative Foods

Nutritional
Vulnerability

**Dietary
Change**



Three Typologies



Unaffected
wealthy nations



Increasing
undernutrition



Acceleration of
nutrition transition

Declining Fish Catch

Alternative Foods

Dietary Change

**Nutritional
Vulnerability**

Aquaculture/Fisheries
Management

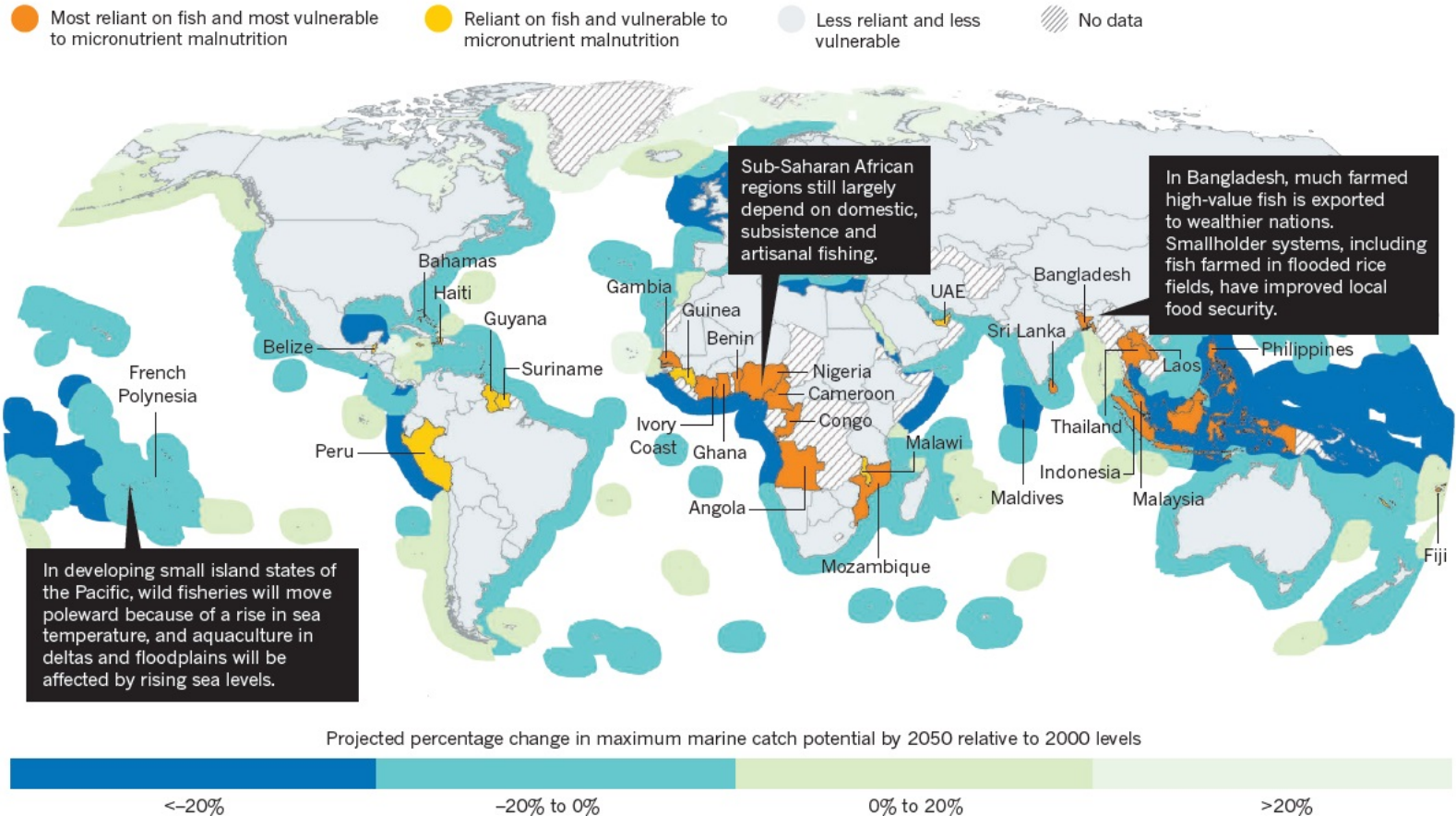
Nutrition: Fall in fish catch threatens human health

Christopher D. Golden, Edward H. Allison, William W. L. Cheung, Madan M. Dey, Benjamin S. Halpern, Douglas J. McCauley, Matthew Smith, Bapu Vaitla, Dirk Zeller & Samuel S. Myers

SOURCE: V. LAM, G. REY-GONDEAU, M. SMITH & W. CHEUNG

TROUBLED WATERS

In the low-latitude developing nations, human nutrition is most dependent on wild fish, and fisheries are most at risk from illegal fishing, weak governance, poor knowledge of stock status, population pressures and climate change. These countries urgently need effective strategies for marine conservation and fisheries management to rebuild stocks for nutritional security.



Declining Fish Catch

**Aquaculture/
Fisheries
Management**

Alternative Foods

Nutritional
Vulnerability

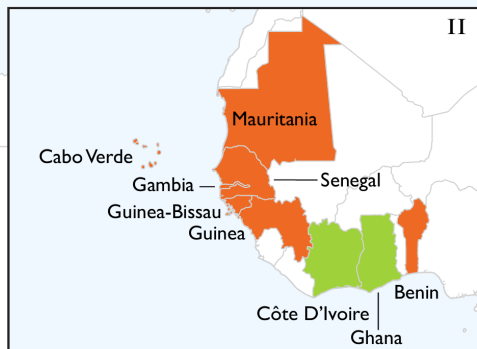
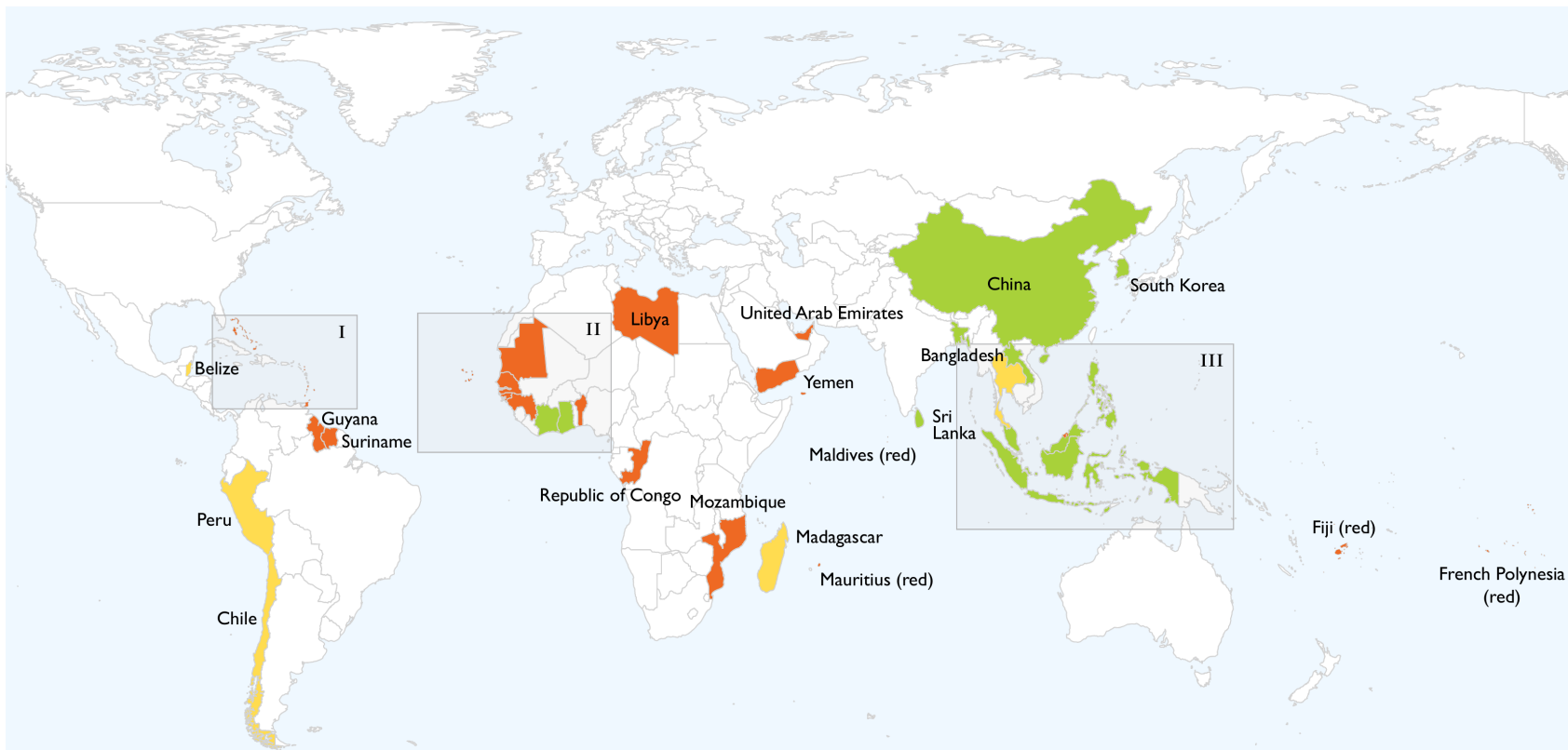
Dietary Change

Aquaculture is Insufficient

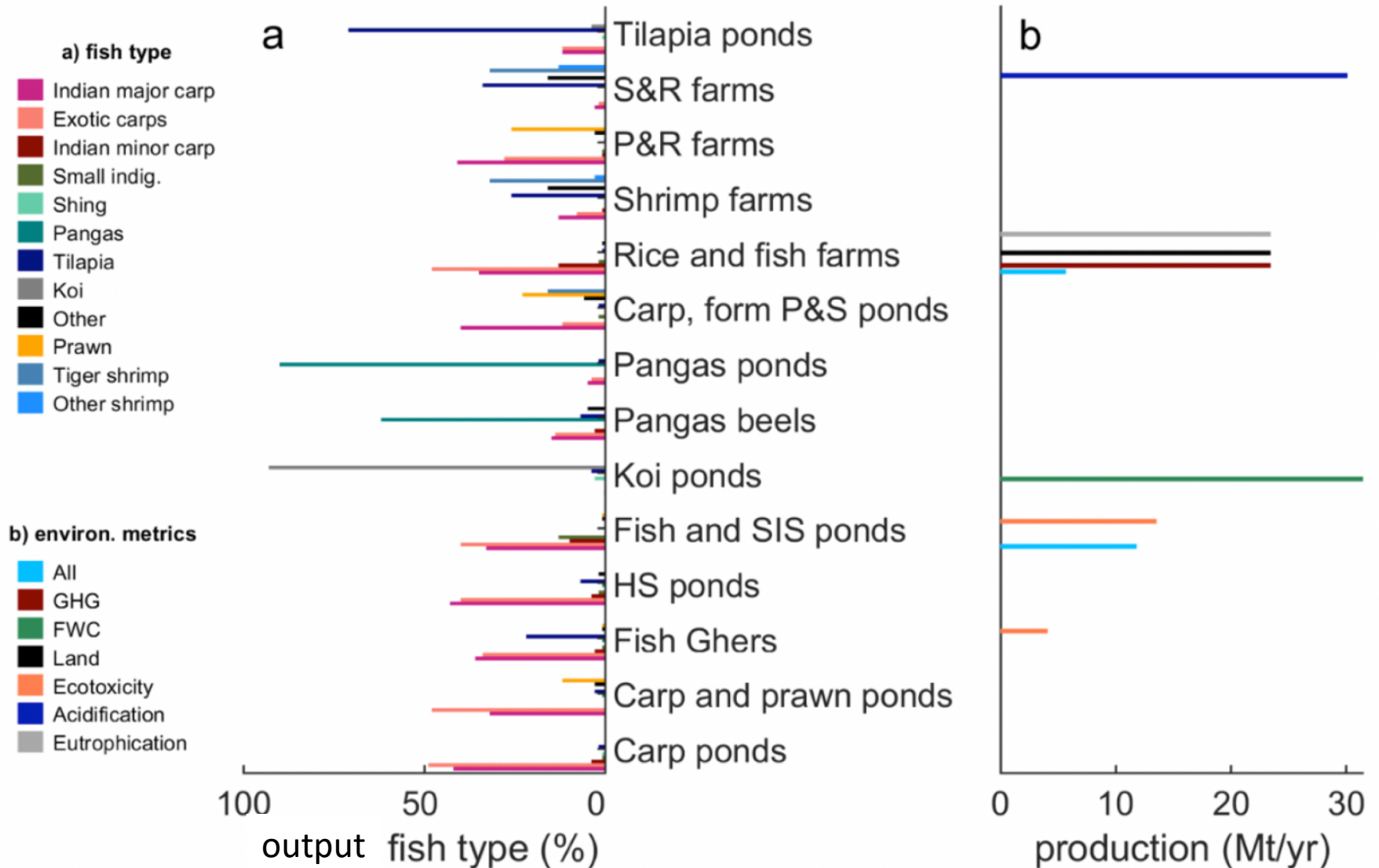
Type: Produce little or no aquaculture
Likelihood to benefit nutrition: Most unlikely

Type: Export-oriented aquaculture
Likelihood to benefit nutrition: Unlikely

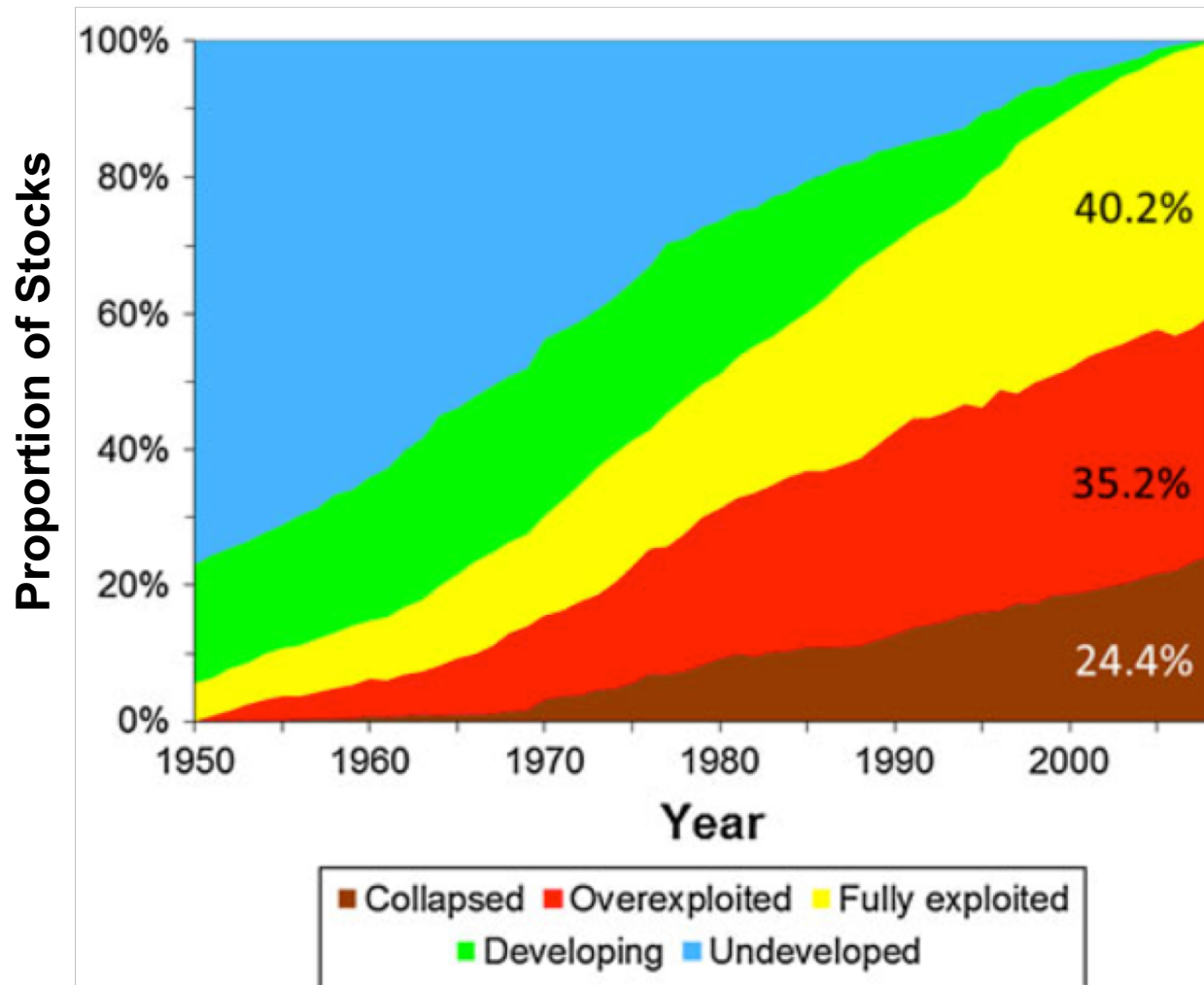
Type: Domestic-oriented aquaculture
Likelihood to benefit nutrition: Possible



Life Cycle Assessment in Aquaculture



Fisheries Management and Marine Conservation as a Nutritional Intervention





Increasing Fish Catch

Strengthening
Resilient Food Systems

Positive Dietary
Change

Nutritional Security

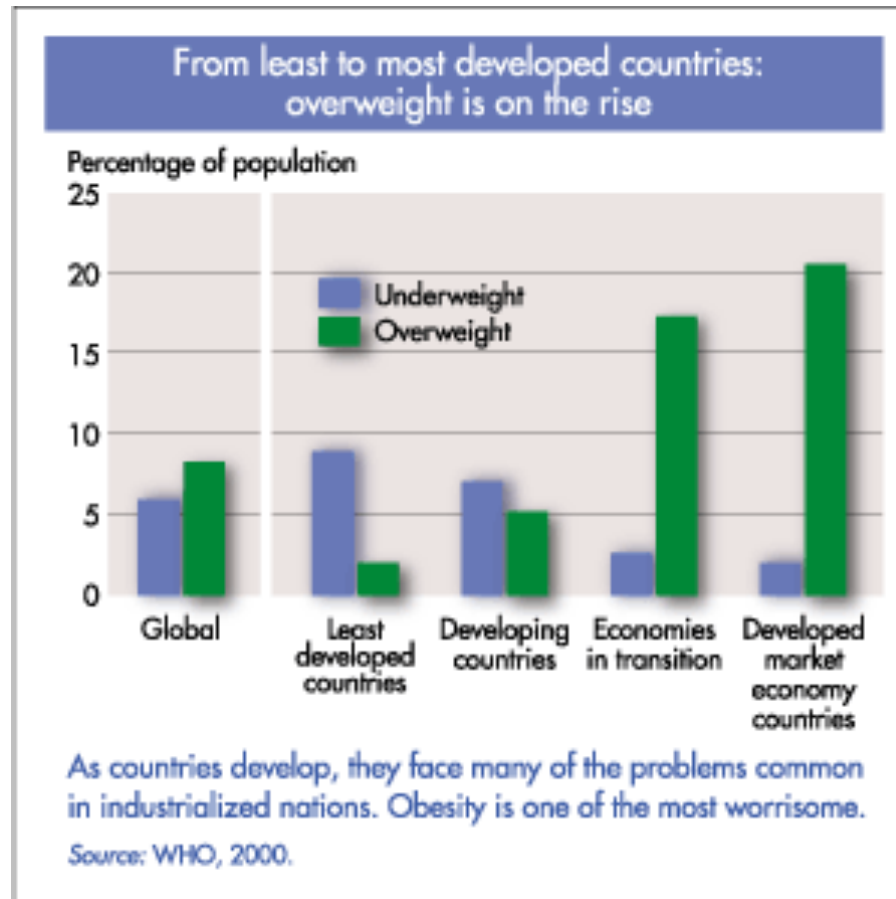
Aquaculture/Fisheries
Management

Interactive Dynamics of Reef Fisheries and Human Health in Kiribati



Kiribati

Nutrition Transitions



Top 10 Most Obese Nations (%)

Not to scale

1

American Samoa

74.6



2

Nauru

71.1



3

Cook Islands

63.4



4

Tokelau

63.4



5

Tonga

57.6



6

Samoa

54.1



7

Palau

48.9



8

Kiribati

46



9

Marshall Islands

45.4

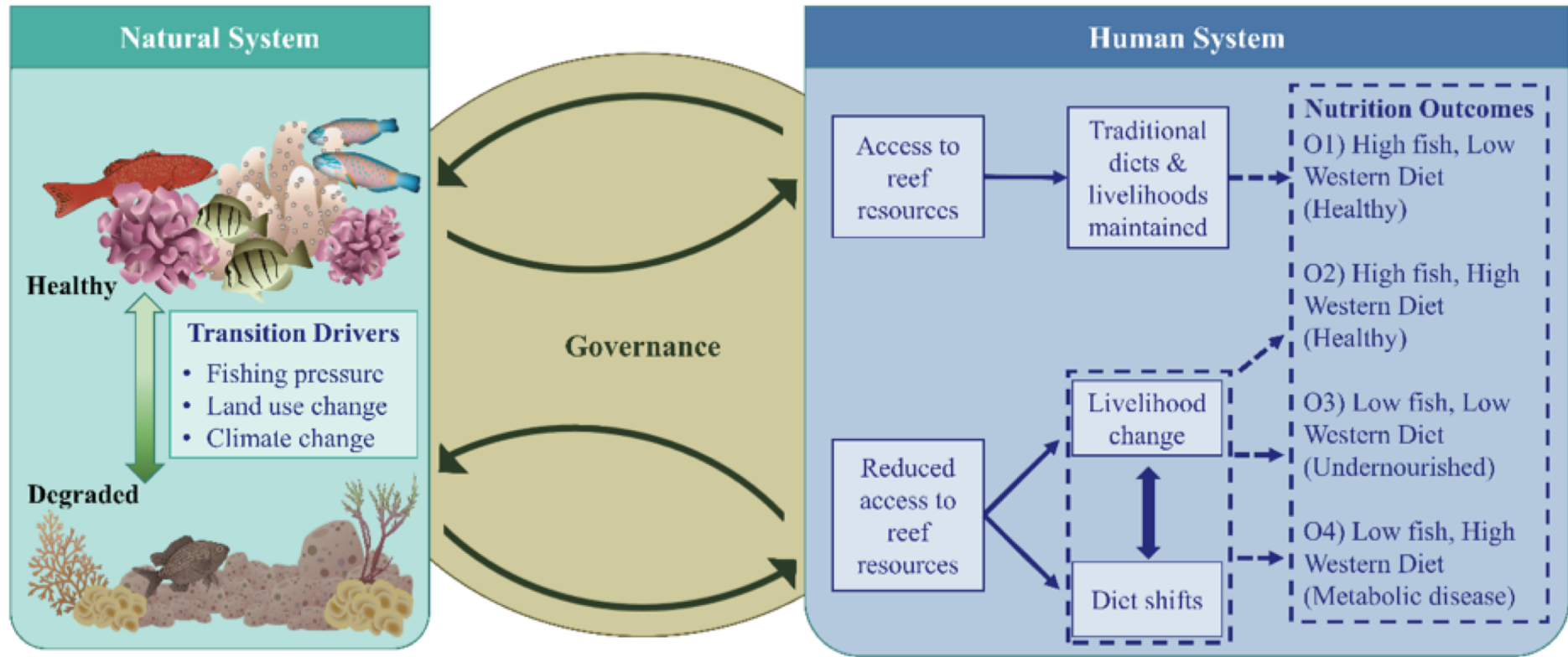


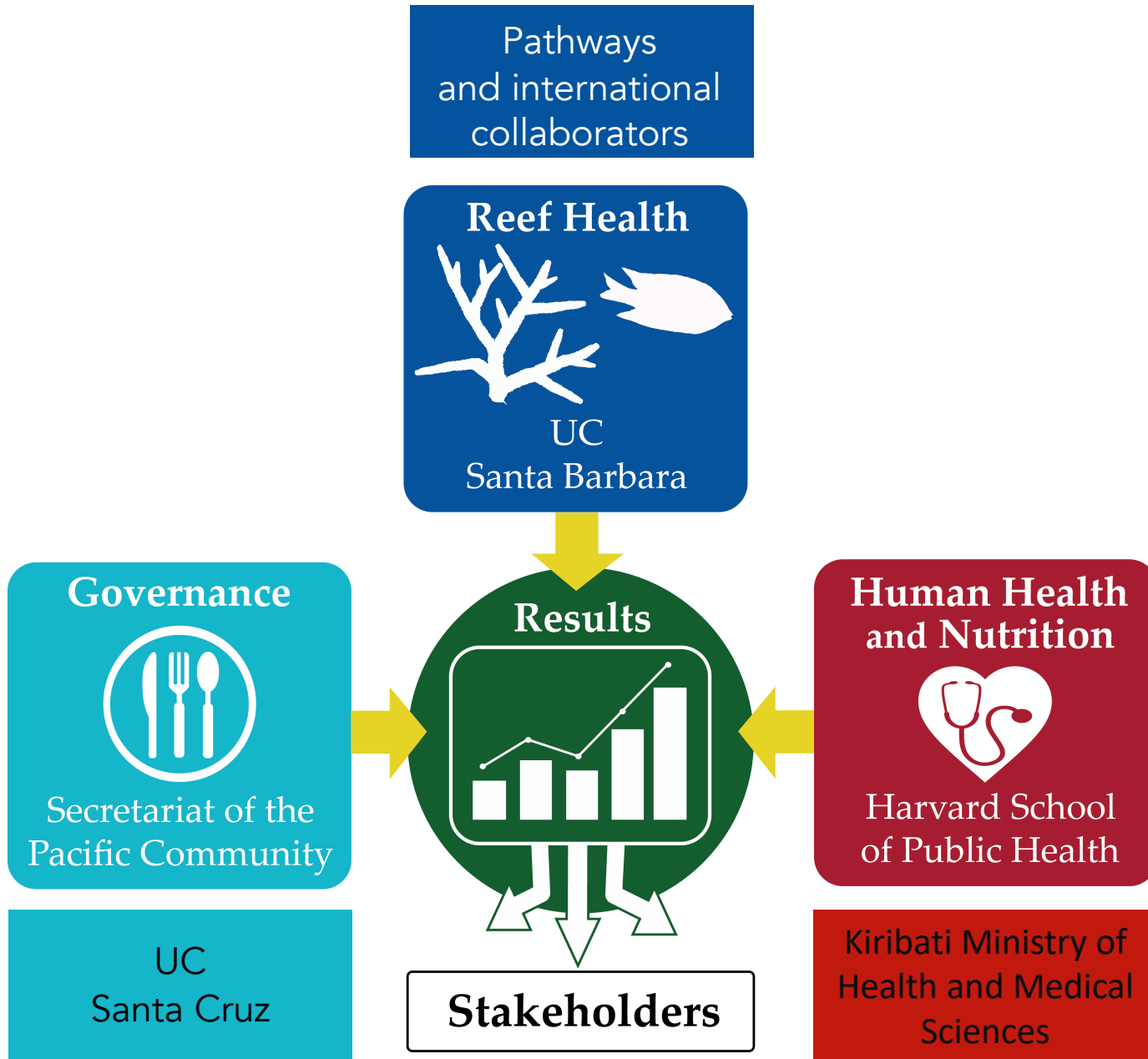
10

Kuwait

42







Health assessment

Fingerstick of blood (Point of Care)

- Metabolic disease markers (total cholesterol, HDL and LDL, triglycerides, and glucose)
- Hemoglobin A1c (diabetes)
- Hemoglobin (anemia)
- Fatty acid profiles of 23 different fatty acids incl. DHA & EPA

Anthropometry and Diagnostics

- Blood pressure
- Standard anthropometry (height/length, weight)
- Abdominal circumference

Acknowledgments

- Katy Seto, Jessica Gephart, Jacob Eurich, Doug McCauley
- Mike Sharp, Andy Halford, and the Secretariat of the Pacific
- Neil Andrew and the Pathways program
- Alon Shepon, Gidon Eshel, Robert Jones, Max Troell, Patrik Henriksson
- Sam Myers, Bapu Vaitla, Eddie Allison



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