

GeFIL- Global Health

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Let me introduce myself ...



Born in mid-20century. Lived in Tokyo, Sapporo, Sendai and Rochester
Hobby; bike, ski, band

•Research field

Toxicology (experimental \Rightarrow human population) \Rightarrow human ecology/sustainability science.

Both toxicology and human ecology examine **human-environmental relationship**.

研究分野: 毒性学(実験 \Rightarrow 人間集団の調査) \Rightarrow 人類生態学, サステナビリティ(学)

毒性学 も 人類生態学 も 人間と環境との関係.

• Effects of hazardous chemicals and essential trace elements on development of organisms.

[both experimental and field studies]

周産期における 有害物質(水銀・ヒ素・カドミウムなど)への曝露 または 必須元素(セレン)の欠乏が神経・行動発達におよぼす影響(実験研究とフィールド研究).

• Susceptibility to arsenic toxicity in South Asian populations [field studies]

南アジアの地下水汚染(ヒ素):誰が敏感か?(フィールド研究)

• Impact of life style transition on health and environment in rural Asia [field studies]

アジア・オセアニア農村部のライフスタイルの変化で, 健康や環境はどう変わっているのか?(フィールド研究)

• Utilization of earth observation data to solve environment-health problems in urban areas.

衛星データ・気候予測モデルが, アジア都市部の環境-健康課題を予測・解決するのにどう役立つか?(フィールド+ α)

Current situation of global health

Overall situation Fairly good achievement
during 20th century

Gap Between developed vs. developing
countries, between rich and poor

Emerging problems
Climate impacts on health, etc.

Gaps



**MDGs (2000-2015) mainly focused on developing countries.
Three goals targeted health; “typical *global health* issues”.**

Emerging problems-

Climate change, ageing, increasing financial burden ...

Key risk	Adaptation issues and prospects	Climatic drivers	Supporting ch. sections	Timeframe	Risk for current and high adaptation																		
Increased risk of crop failure and lower crop production could lead to food insecurity in Asia (<i>medium confidence</i>)	Autonomous adaptation of farmers on-going in many parts of Asia.		24.4.4	<table border="1"> <tr> <td></td> <td>Very low</td> <td>Medium</td> <td>Very high</td> </tr> <tr> <td>Present</td> <td colspan="3"></td> </tr> <tr> <td>Near-term (2030-2040)</td> <td colspan="3"></td> </tr> <tr> <td rowspan="2">Long-term (2080-2100)</td> <td>2°C</td> <td colspan="2"></td> </tr> <tr> <td>4°C</td> <td colspan="2"></td> </tr> </table>		Very low	Medium	Very high	Present				Near-term (2030-2040)				Long-term (2080-2100)	2°C			4°C		
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Water shortage in arid areas of Asia (<i>medium confidence</i>)	Limited capacity for water resource adaptation; options include developing water saving technology, changing drought-resilient crops, building more water reservoirs.		24.4.1.3, 24.4.1.4	<table border="1"> <tr> <td></td> <td>Very low</td> <td>Medium</td> <td>Very high</td> </tr> <tr> <td>Present</td> <td colspan="3"></td> </tr> <tr> <td>Near-term (2030-2040)</td> <td colspan="3"></td> </tr> <tr> <td rowspan="2">Long-term (2080-2100)</td> <td>2°C</td> <td colspan="2"></td> </tr> <tr> <td>4°C</td> <td colspan="2"></td> </tr> </table>		Very low	Medium	Very high	Present				Near-term (2030-2040)				Long-term (2080-2100)	2°C			4°C		
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Increased flooding leading to widespread damage to infrastructure and settlements in Asia (<i>medium confidence</i>)	Adaptation measures include extreme weather exposure reduction via effective land-use planning, selective relocation and structural measures; reduction in the vulnerability of lifeline infrastructure and services (water, energy, waste management, food, biomass, mobility, local ecosystems and telecommunications) and measures to assist vulnerable sectors and households.		24.4.5.1, 24.4.5.2, 24.4.5.3, 24.4.5.5,	<table border="1"> <tr> <td></td> <td>Very low</td> <td>Medium</td> <td>Very high</td> </tr> <tr> <td>Present</td> <td colspan="3"></td> </tr> <tr> <td>Near-term (2030-2040)</td> <td colspan="3"></td> </tr> <tr> <td rowspan="2">Long-term (2080-2100)</td> <td>2°C</td> <td colspan="2"></td> </tr> <tr> <td>4°C</td> <td colspan="2"></td> </tr> </table>		Very low	Medium	Very high	Present				Near-term (2030-2040)				Long-term (2080-2100)	2°C			4°C		
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Increased risk of flood-related deaths, injuries, infectious diseases and mental disorders (<i>medium confidence</i>)	Disaster preparedness including early-warning systems and local coping strategies.		24.4.6.2, 24.4.6.3, 24.4.6.5	<table border="1"> <tr> <td></td> <td>Very low</td> <td>Medium</td> <td>Very high</td> </tr> <tr> <td>Present</td> <td colspan="3"></td> </tr> <tr> <td>Near-term (2030-2040)</td> <td colspan="3"></td> </tr> <tr> <td rowspan="2">Long-term (2080-2100)</td> <td>2°C</td> <td colspan="2"></td> </tr> <tr> <td>4°C</td> <td colspan="2"></td> </tr> </table>		Very low	Medium	Very high	Present				Near-term (2030-2040)				Long-term (2080-2100)	2°C			4°C		
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Increased risk of heat-related mortality (<i>high confidence</i>)	Heat health-warning systems, urban planning to reduce heat islands and improvement of built environment.		24.4.6.2, 24.4.6.3, 24.4.6.5	<table border="1"> <tr> <td></td> <td>Very low</td> <td>Medium</td> <td>Very high</td> </tr> <tr> <td>Present</td> <td colspan="3"></td> </tr> <tr> <td>Near-term (2030-2040)</td> <td colspan="3"></td> </tr> <tr> <td rowspan="2">Long-term (2080-2100)</td> <td>2°C</td> <td colspan="2"></td> </tr> <tr> <td>4°C</td> <td colspan="2"></td> </tr> </table>		Very low	Medium	Very high	Present				Near-term (2030-2040)				Long-term (2080-2100)	2°C			4°C		
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The most recent IPCC report (AR5) spends substantial pages on health impact of climate change.

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Major causes of death in human history

+ “Emergent infectious diseases”,
+ NTD

“Globalization”

Emergence of larger cities + Measles, smallpox, rubella
+ Diseases spread through Human-human infection

Emergence of Small cities

+ bacterial infection in GI or in respiratory system

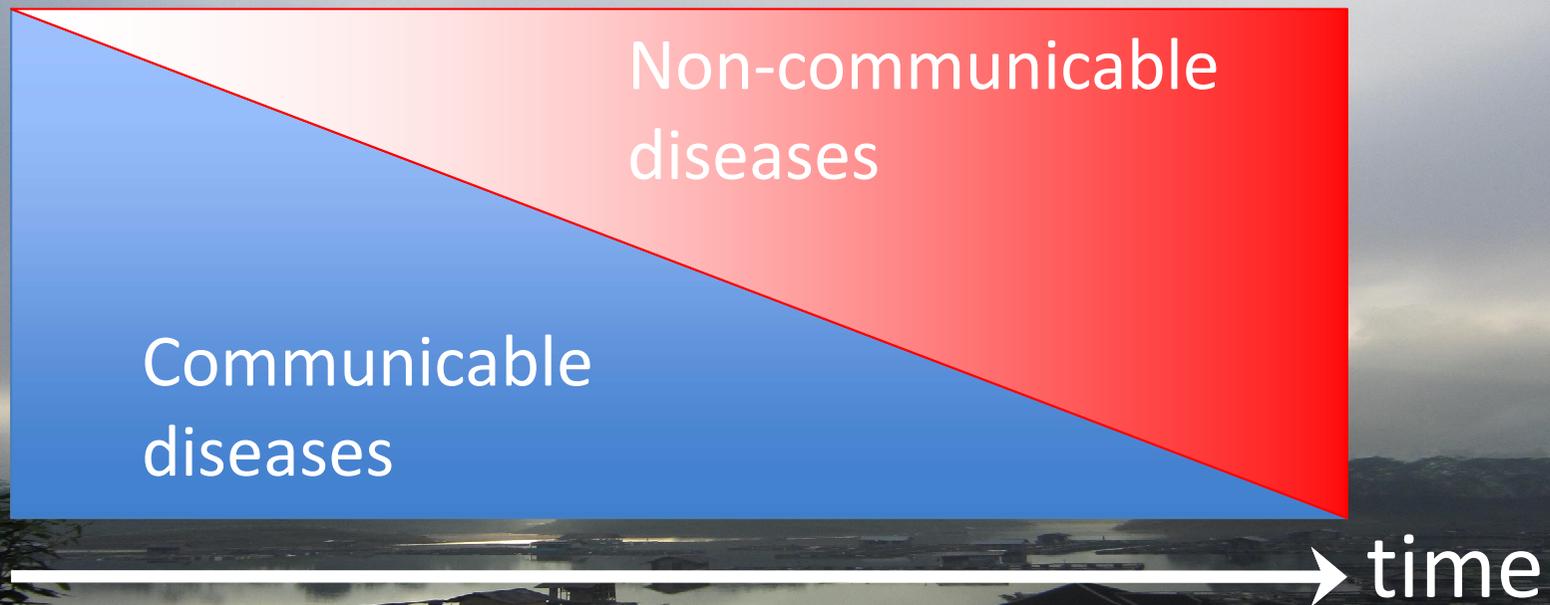
Beginning of Food Production

trauma, warfare, arbovirus, TB, rabies

New health issues have kept on “emerging”

Recent “epidemiological transition”

Communicable diseases ⇒ **“con-communicable diseases”**.



Concept of health:

“a given fact/fate” ⇒

“what we can manipulate”

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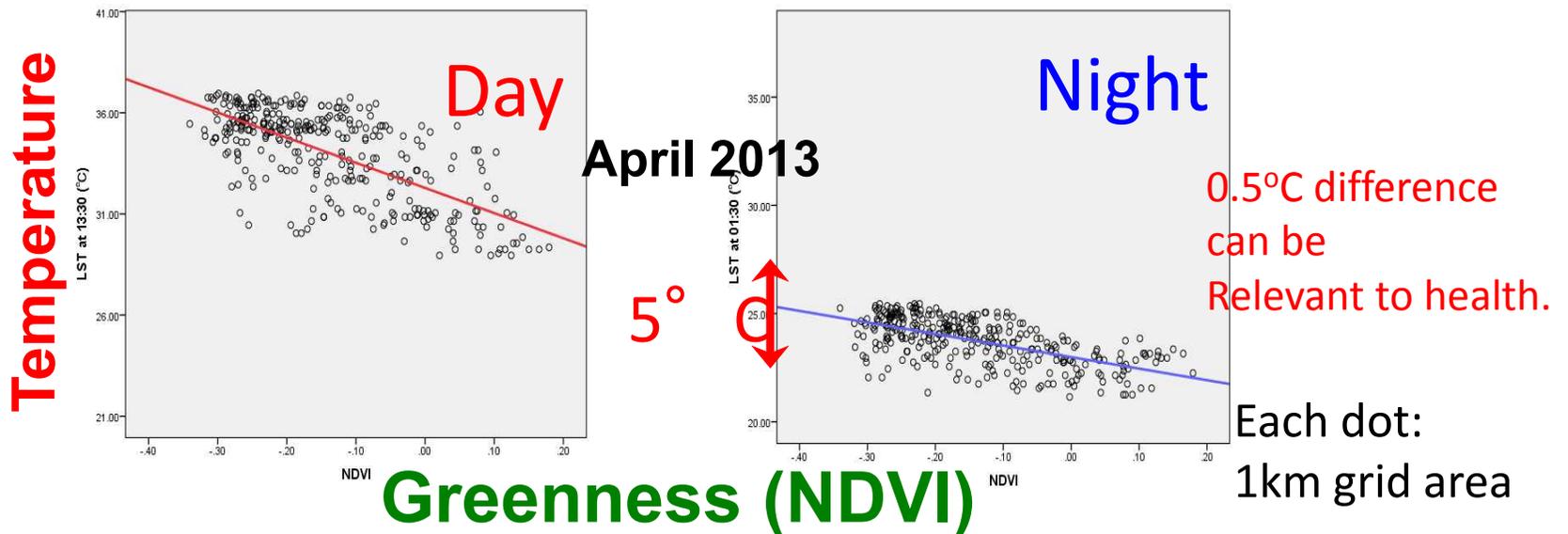
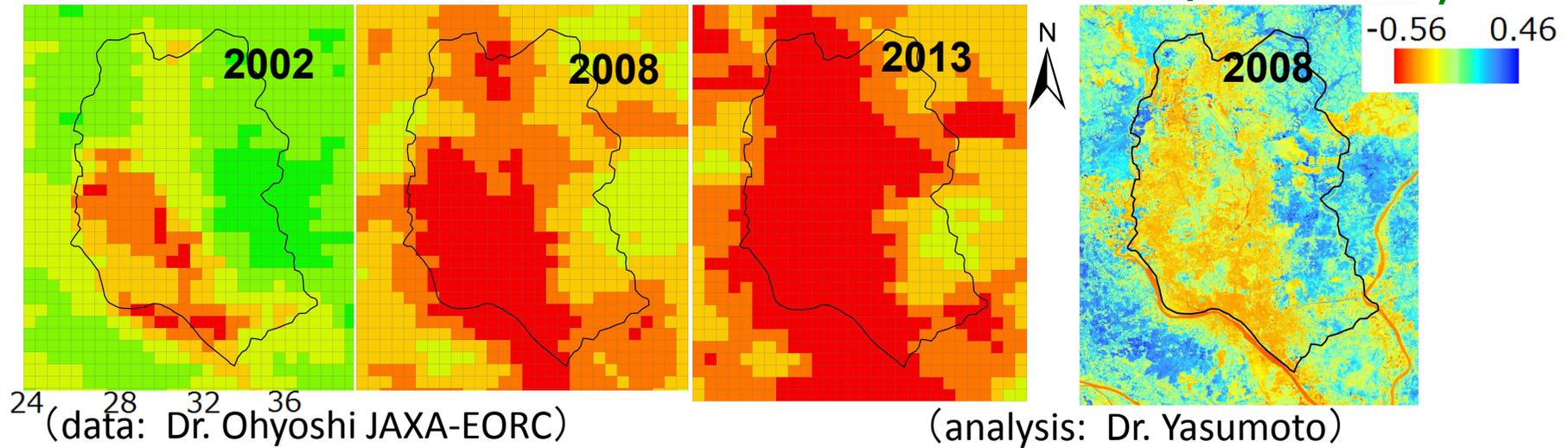


**Solution for health issues
involves non-medical actions.**

Green alleviates heat; Dhaka, Bangladesh

Surface Temperature; April

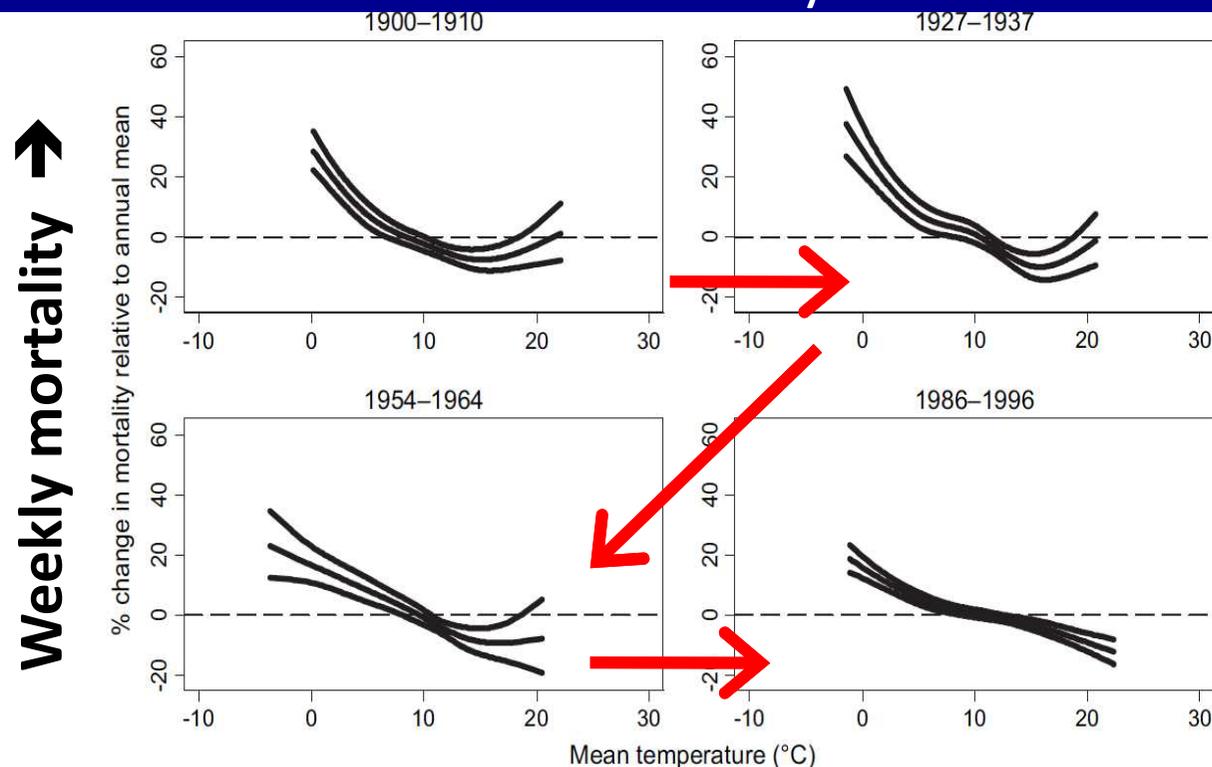
NDVI (Greenness)



Appropriate urban planning can reduce health risk.

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Change in Temperature-mortality relationship in 20th Century in *London*



1. Percent change in all-cause mortality by mean weekly temperature in London, United Kingdom, over the course of the 20th century. Graphs are based on cubic smoothing splines (1 df per 5°C of temperature). Results were adjusted for season.

Weekly temperature →

Possible causes: Engineering (A/C), health service (improved ambulance services and emergency care), education (hygiene education) (Carson et al., 2006).

Liver Fluke (*Opisthorchis viverrini*) ; a parasitosis in Thailand, which might increase the risk of cancer.



Treatment of patients (**red**) would not terminate this cycle. Land/water use, snail/fish ecology, and human behavior can be the target of intervention (**green**).



Thinking about Priority and Conflict

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Who should be saved?

Cost of saving healthy life [USD/DALY]

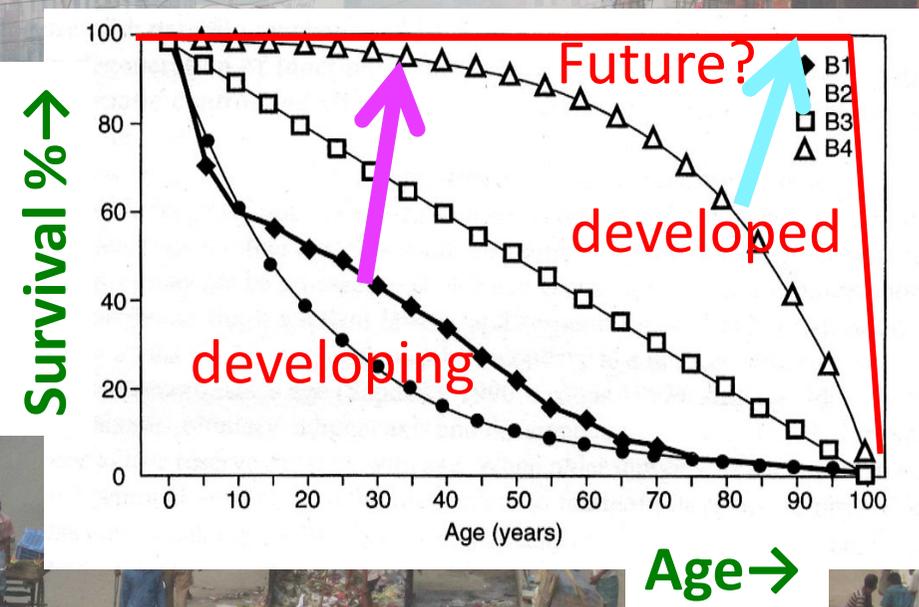
CVD 63

DM 102

Malaria 6

TB 11

- Disability-Adjusted Life Years (Cohen, 2006)





“Can **irrigation** hazardous to your health?”
from future earth topic (2013)

What should be saved;
food production vs. human
health?

Production and use of **chemical fertilizer** changes Nitrogen flow

Rockstrom et al. (2008)

PLANETARY BOUNDARIES				
Earth-system process	Parameters	Proposed boundary	Current status	Pre-industrial value
Climate change	(i) Atmospheric carbon dioxide concentration (parts per million by volume)	350	387	280
	(ii) Change in radiative forcing (watts per metre squared)	1	1.5	0
Rate of biodiversity loss	Extinction rate (number of species per million species per year)	10	>100	0.1-1
Nitrogen cycle (part of a boundary with the phosphorus cycle)	Amount of N ₂ removed from the atmosphere for human use (millions of tonnes per year)	35	121	0
Phosphorus cycle (part of a boundary with the nitrogen cycle)	Quantity of P flowing into the oceans (millions of tonnes per year)	11	8.5-9.5	-1
Stratospheric ozone depletion	Concentration of ozone (Dobson unit)	276	283	290
Ocean acidification	Global mean saturation state of aragonite in surface sea water	2.75	2.90	3.44
Global freshwater use	Consumption of freshwater by humans (km ³ per year)	4,000	2,600	415
Change in land use	Percentage of global land cover converted to cropland	15	11.7	Low
Atmospheric aerosol loading	Overall particulate concentration in the atmosphere, on a regional basis	To be determined		
Chemical pollution	For example, amount emitted to, or concentration of persistent organic pollutants, plastics, endocrine disrupters, heavy metals and nuclear waste in, the global environment, or the effects on ecosystem and functioning of Earth system thereof	To be determined		

Boundaries for processes in red have been crossed. Data sources: ref. 10 and supplementary information

The super killer



Dichloro-diphenyl
Trichloroethane (DDT)
ジクロロジフェニル
トリクロロエタン

The super killer

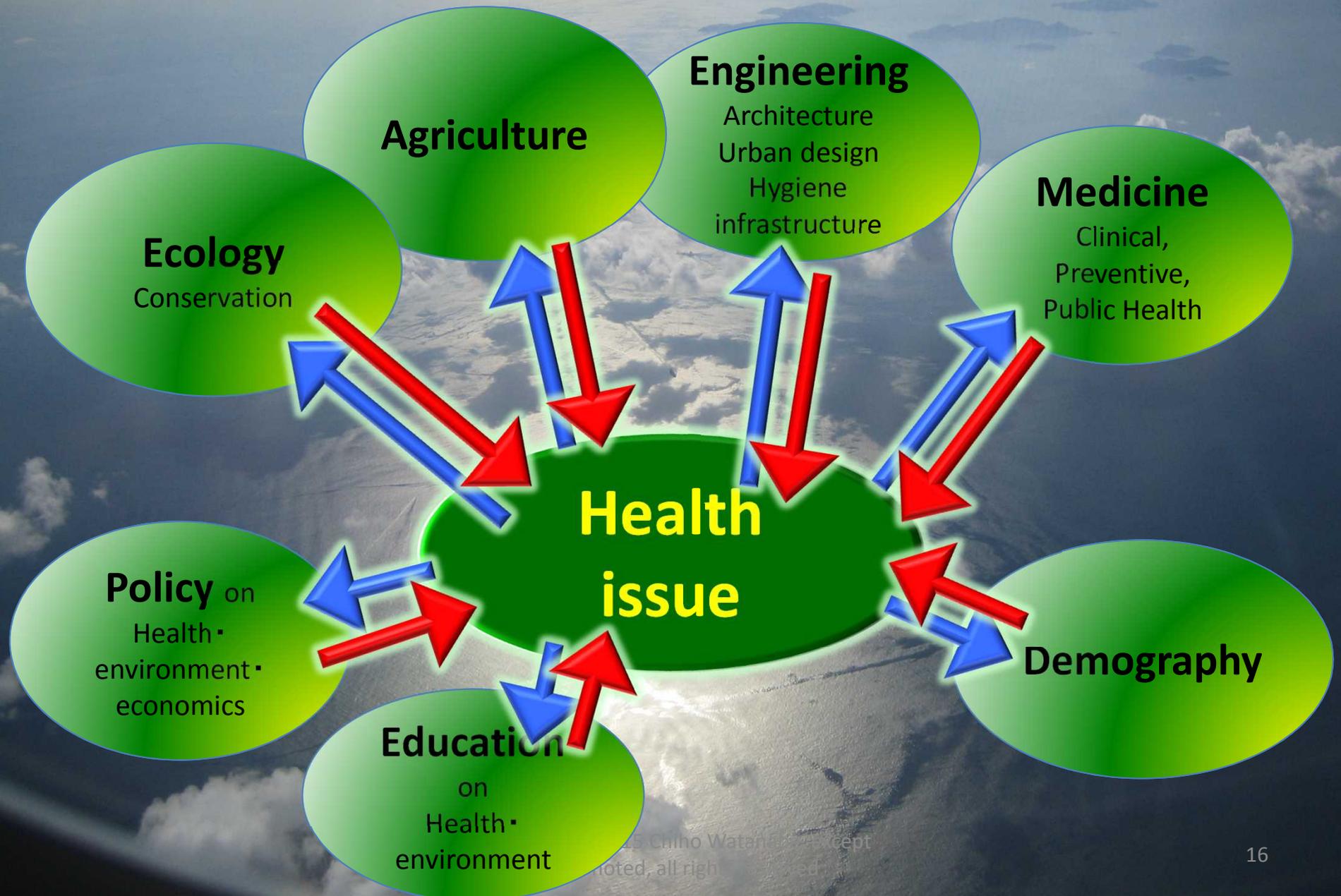
1940s introduced

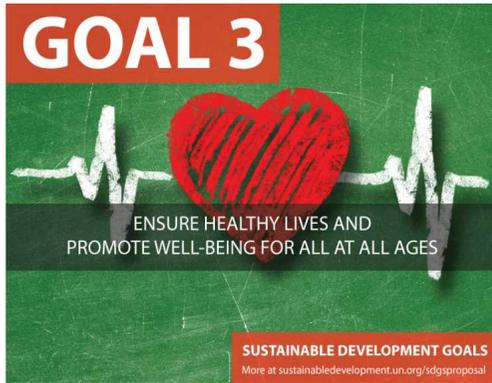
1970s expelled

2006 re-introduced (WHO)

Health of children / health of ecosystem ?

The way out Potential output fields





SDGs (2015-)

for both developed and developing countries

<p>→ Goal 1 End poverty in all its forms everywhere</p> <p>→ Goal 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture</p> <p>→ Goal 3 Ensure healthy lives and promote well-being for all at all ages</p> <p>→ Goal 4 Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all</p> <p>→ Goal 5 Achieve gender equality and empower all women and girls</p> <p>→ Goal 6 Ensure availability and sustainable management of water and sanitation for all</p> <p>→ Goal 7 Ensure access to affordable, reliable, sustainable and modern energy for all</p> <p>Goal 8 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all</p>	<p>→ Goal 9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation</p> <p>→ Goal 10 Reduce inequality within and among countries</p> <p>→ Goal 11 Make cities and human settlements inclusive, safe, resilient and sustainable</p> <p>Goal 12 Ensure sustainable consumption and production patterns</p> <p>→ Goal 13 Take urgent action to combat climate change and its impacts*</p> <p>Goal 14 Conserve and sustainably use the oceans, seas and marine resources for sustainable development</p> <p>→ Goal 15 Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss</p> <p>Goal 16 Promote peaceful and inclusive societies for sustainable development, provide access to</p> <p>Goal 17 Strengthen the means of implementation and revitalize the global partnership for sustainable development</p>
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Global Health

Don't leave it to doctors!

Thanks, and
hope to see you at the class!

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