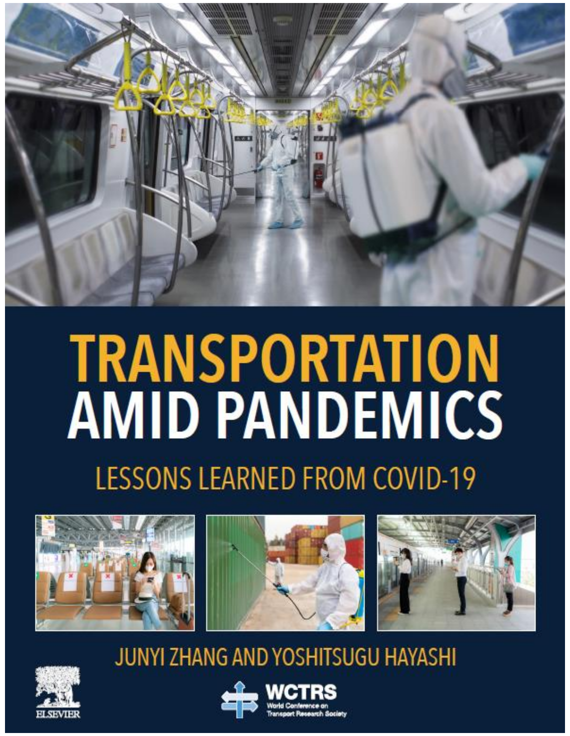
International Symposium
"Transforming Mobility for Humanity"

Commemorating the 50th Anniversary of
The Club of Rome "The Limits to Growth"

December 14, 2022
Venue: Bangkok, Thailand



Pandemic Shock in Mobility

Junyi ZHANG

Co-chair, WCTRS COVID-19 Task Force

Prof. Dr. Eng., Hiroshima University

THE CLUB OF ROME

HIROSHIMA UNIVERSITY

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Pandemic shocks!

Changes in global mobilities during COVID-19 pandemic

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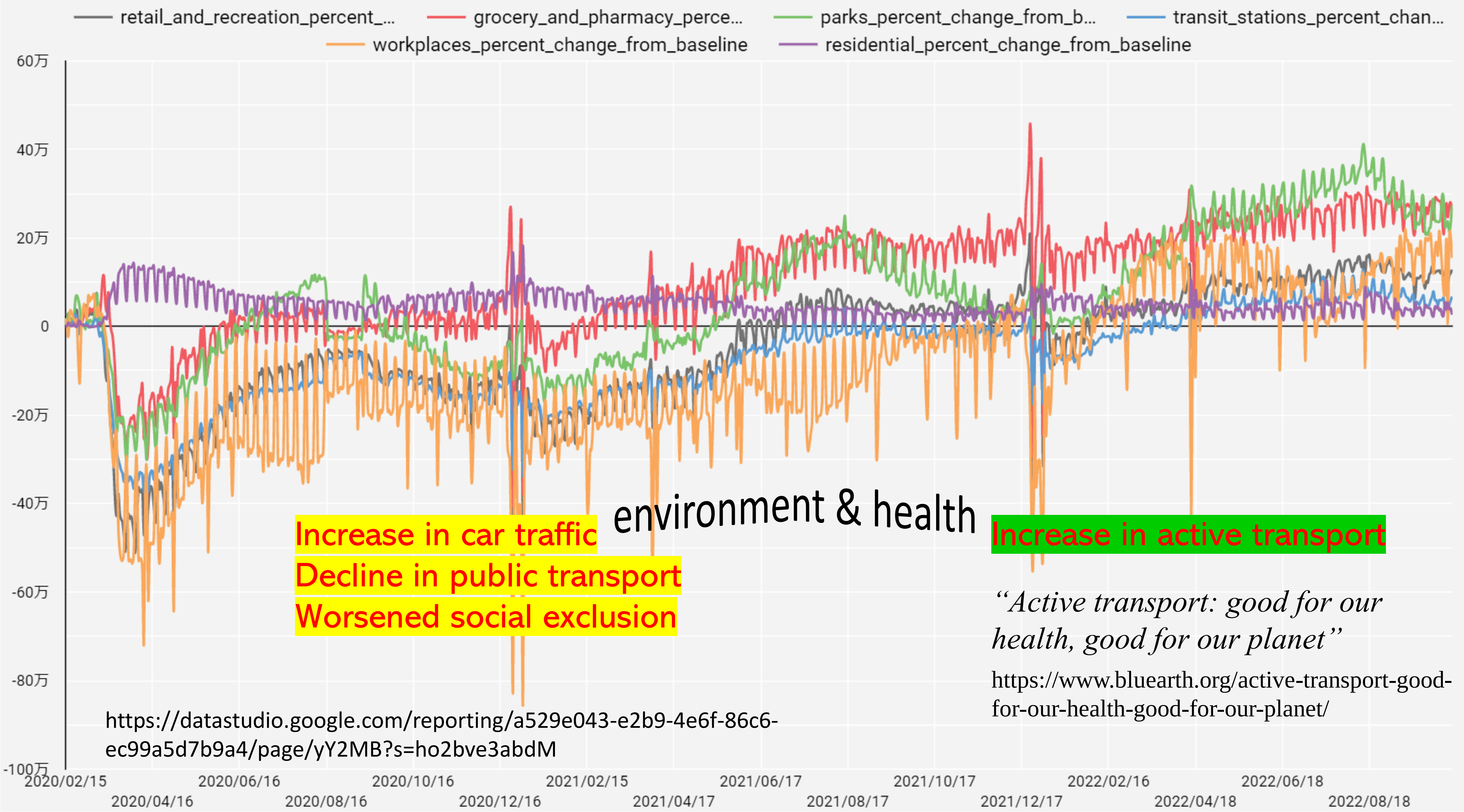

environment & health

Increase in car traffic
Decline in public transport
Worsened social exclusion

https://datastudio.google.com/reporting/a529e043-e2b9-4e6f-86c6-ec99a5d7b9a4/page/yY2MB?s=ho2bve3abdM

Increase in active transport

"Active transport: good for our health, good for our planet"

https://www.bluearth.org/active-transport-good-for-our-health-good-for-our-planet/

hang

Unequal impacts

- Zhang, J., Hayashi, Y., et al. (2021) The COVID-19 Pandemic and Transport Policy: State of the Art and State of the Practice. In: Hayashi, Y, et al. (eds.), Frontiers in High-Speed Rail Development. pp.17-72, ADB Institute Press, Tokyo, Japan.

- CDC, USA: https://www.cdc.gov/mmwr/volumes/71/wr/mm7133a4.htm

Higher infection and mortality rates of transport workers

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China: Bus travel in Ningbo, China during Jan 21-Mar 6 (2147 persons with close contacts with infected persons): 6.15% (132) were infected, where 11.91% used the same transport vehicles. The attack rate in train passengers on seats within a distance of 3 rows and 5 columns of an infected person varied from 0 to 10.3%.

France: among 2830 clusters, 33 clusters (1.2%) were transport (plane, boat, train).

Sweden: taxi drivers are the highest risk among all occupations - 4.8 times higher than in all other professions, followed by bus and tram drivers (4.3 times).

UK: male taxi drivers and chauffeurs and bus and coach drivers had statistically significantly higher mortality rates from COVID-19 than the general male population (65.3 deaths per 100 000 males > 39.7 per 100 000 men for general).

California (Jan 2020–May 2022): Among 5,641 outbreak-associated cases, 537 COVID-19–associated deaths were identified among public transportation industries. Public transportation's cumulative incidence and mortality rates were 1.5 times as high as that for all industries; incidence was 5.2 times as high, and mortality was 1.8 times as high in bus and urban transit as in all industries.

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Unequal impacts

Frontline workers, migrants and racial/ethnic minorities at risk

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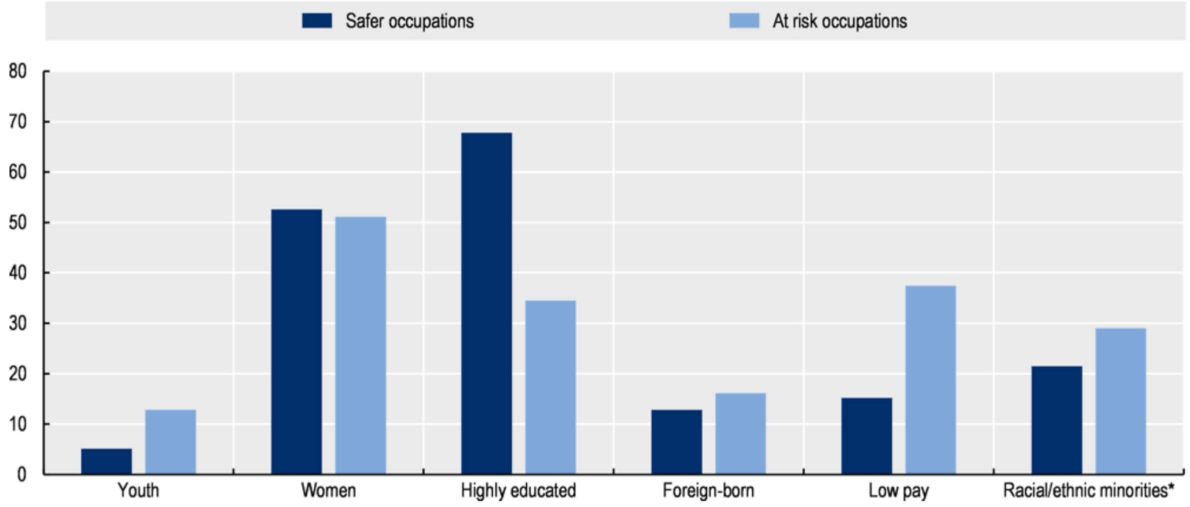
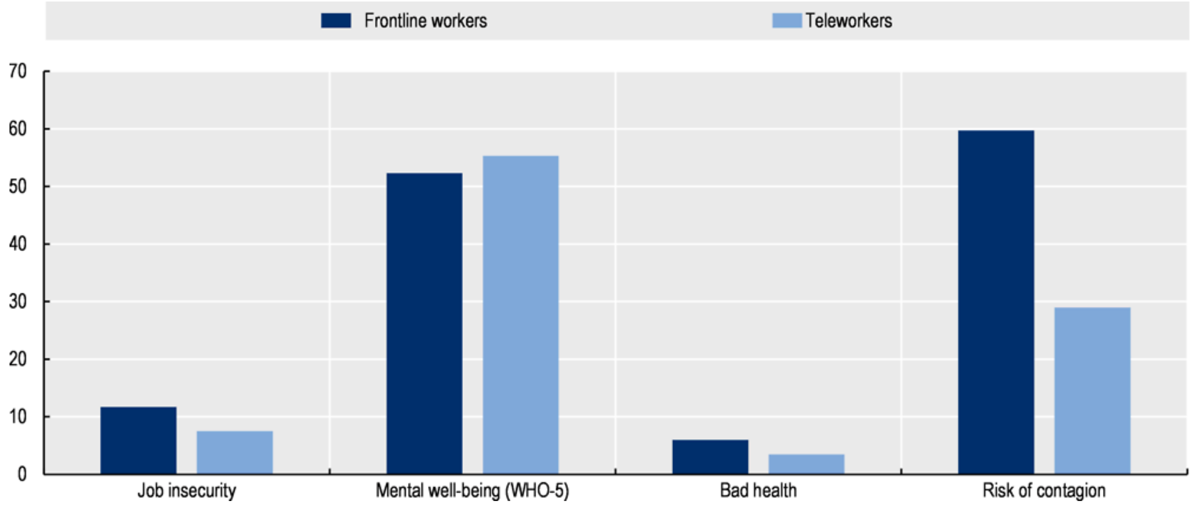
- https://www.oecd.org/coronavirus/policy-responses/the-unequal-impact-of-covid-19-a-spotlight-on-frontline-workers-migrants-and-racial-ethnic-minorities-f36e931e/

At the onset of the pandemic, across the OECD 44% of workers were in these "at-risk" jobs. The figure ranges from 40% or less in Lithuania, Germany, the Czech Republic and Luxembourg, to just over 50% in Spain, Ireland and Greece.

Compared to safer jobs that offered the possibility to telework already before the pandemic, on average across the OECD, these at-risk occupations employed more low-wage workers (37% vs 15%), more young workers (12% vs 5%) and a much lower share of workers with tertiary education (on average 34% vs 67%). Foreign-born workers also accounted for a higher share of at-risk jobs than teleworkable ones in almost all countries (16% vs 13% on average), with the exceptions of Luxembourg and Portugal.





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Unequal impacts

Bad working conditions and unemployed transport workers

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- Thierry Vanelslander (2022) in Zhang & Hayashi (2022), Transportation Amid Pandemics: Lessons Learned from COVID-19. Chapter 12.

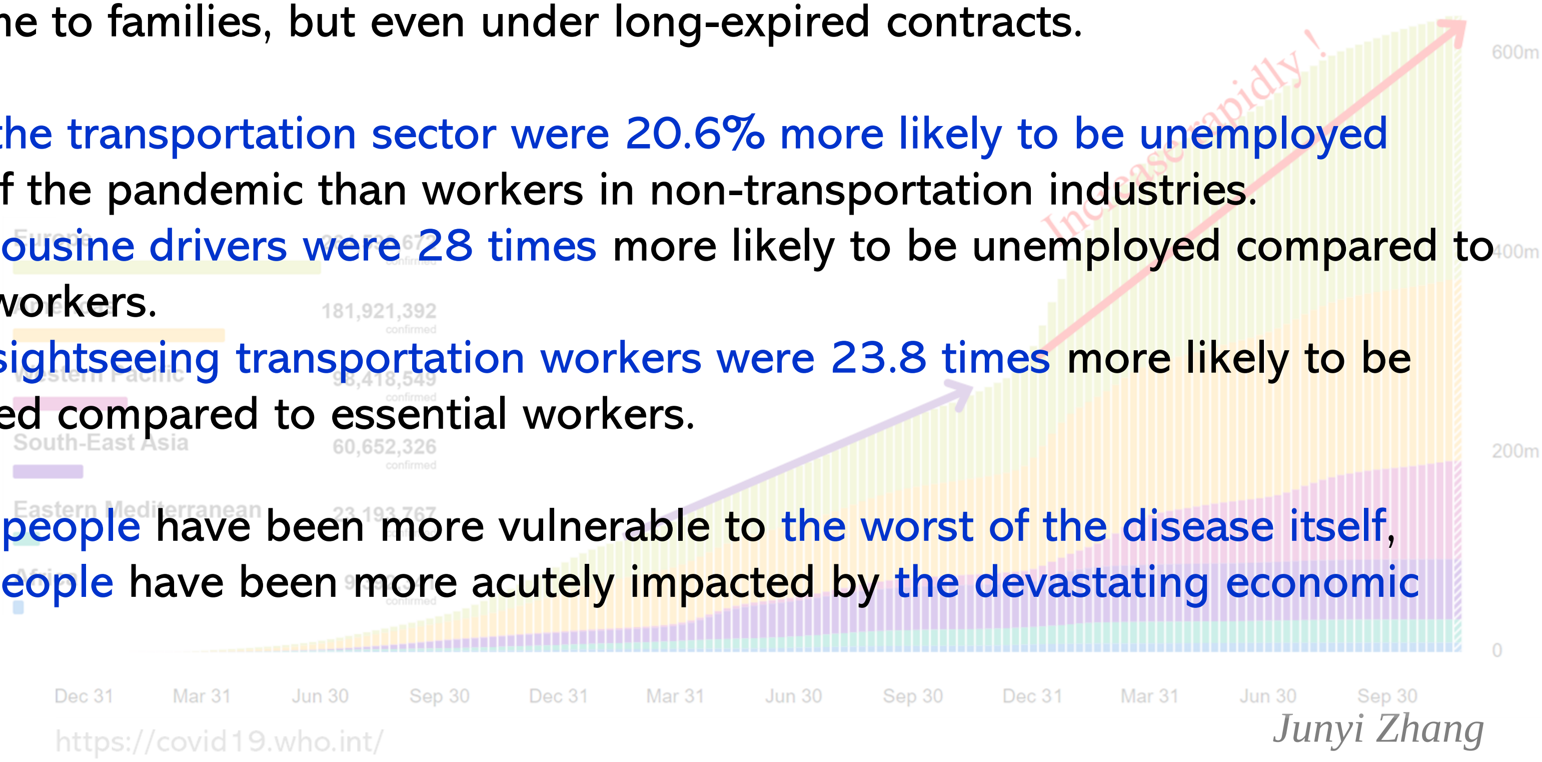
By mid-June 2020, about 300,000 regular ship crew members and 70,000 cruise ship seafarers were awaiting their regular crew changeover. At the same time, only 30% of governments worldwide allowed such changeovers. Lack of crew changeover possibilities led to inhuman situations at sea, with staff having working times and contracts often long overdue. It is first of all clear that substandard conditions in which many ship crews had to work for months, without possibility of going home to families, but even under long-expired contracts.

- Elizabeth A. Mack, Shubham Agrawal, Sicheng Wang (2021) https://doi.org/10.1016/j.trip.2021.100470

Workers in the transportation sector were 20.6% more likely to be unemployed because of the pandemic than workers in non-transportation industries.
Taxi and limousine drivers were 28 times more likely to be unemployed compared to essential workers.
Scenic and sightseeing transportation workers were 23.8 times more likely to be unemployed compared to essential workers.

- https://www.itfglobal.org/sites/default/files/node/resources/files/ITF_Young%20Transport_FINAL.pdf

While older people have been more vulnerable to the worst of the disease itself, younger people have been more acutely impacted by the devastating economic impacts.



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Unequal impacts

Gaps between the global north and south with respect to the changes in mobilities during COVID-19 pandemic

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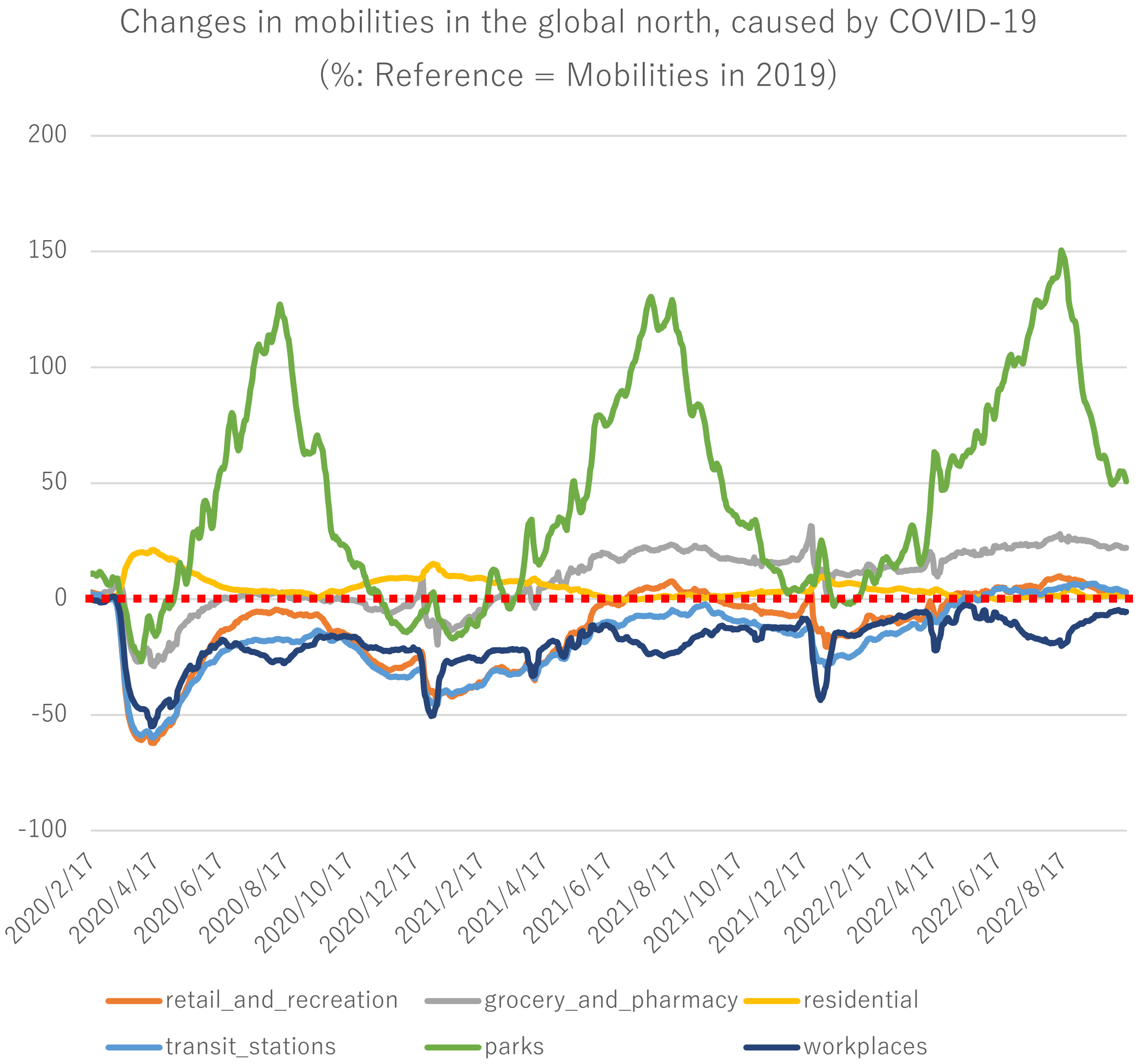

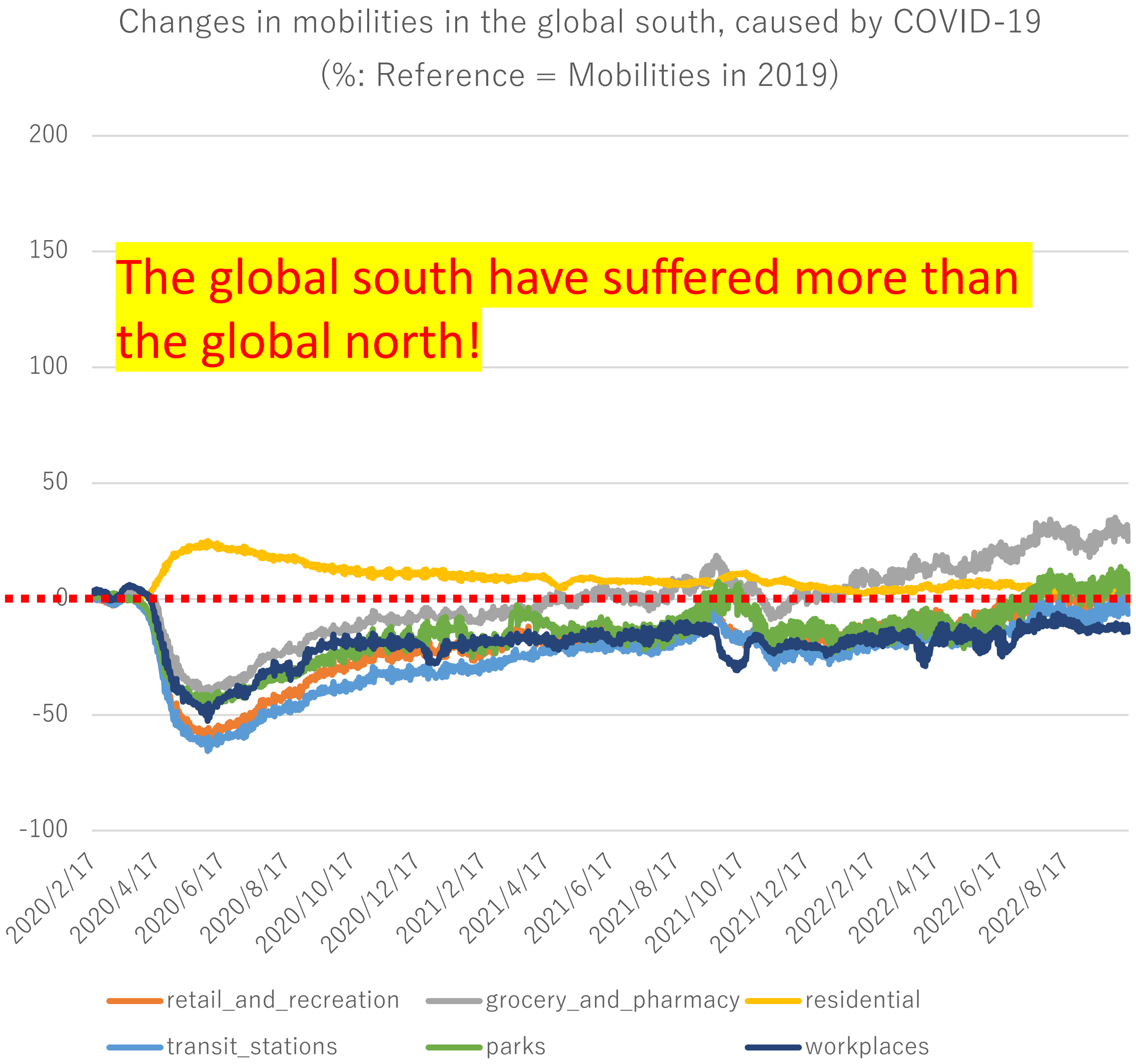

Source: COVID-19 Community Mobility Reports - Google

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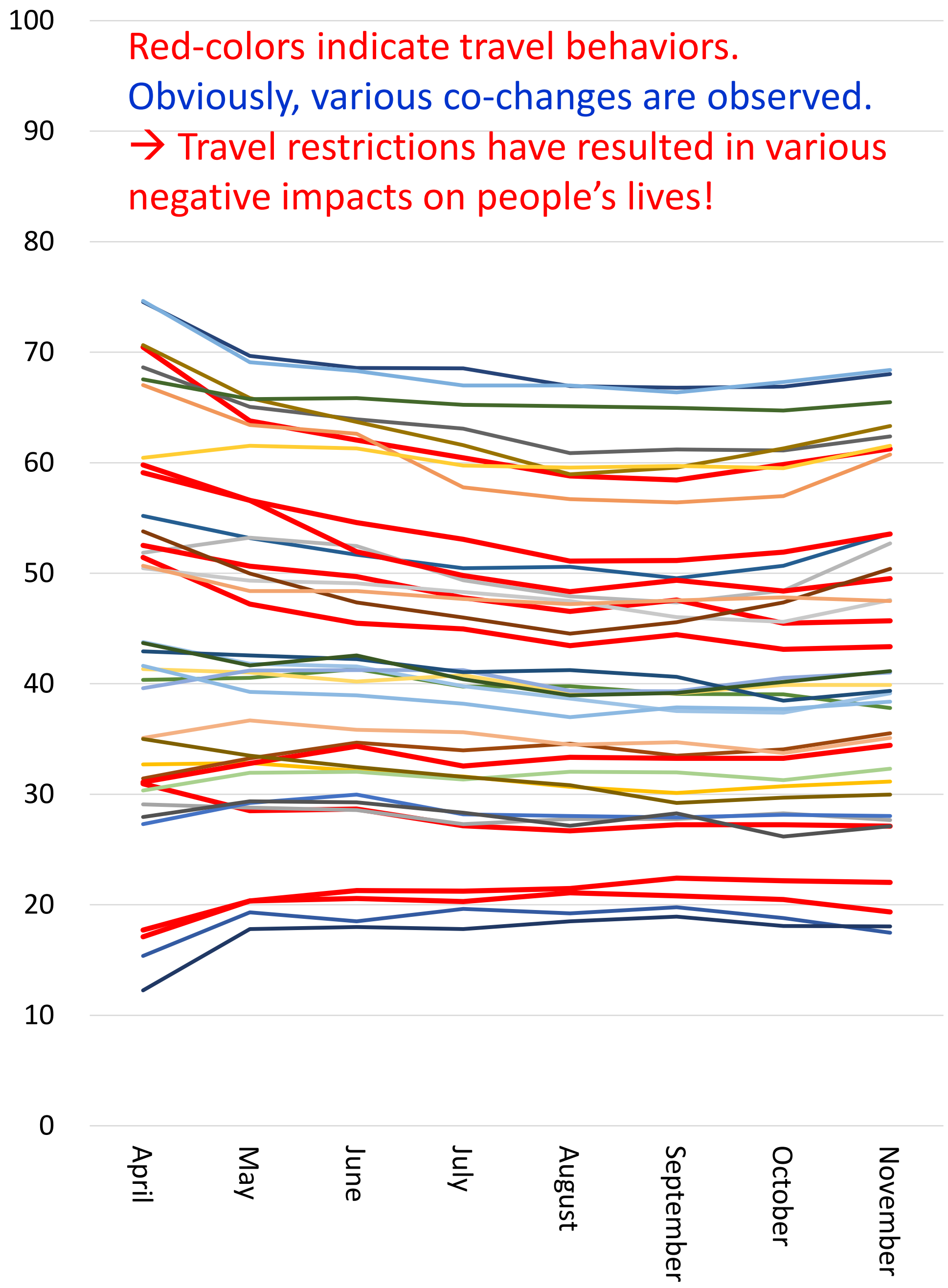
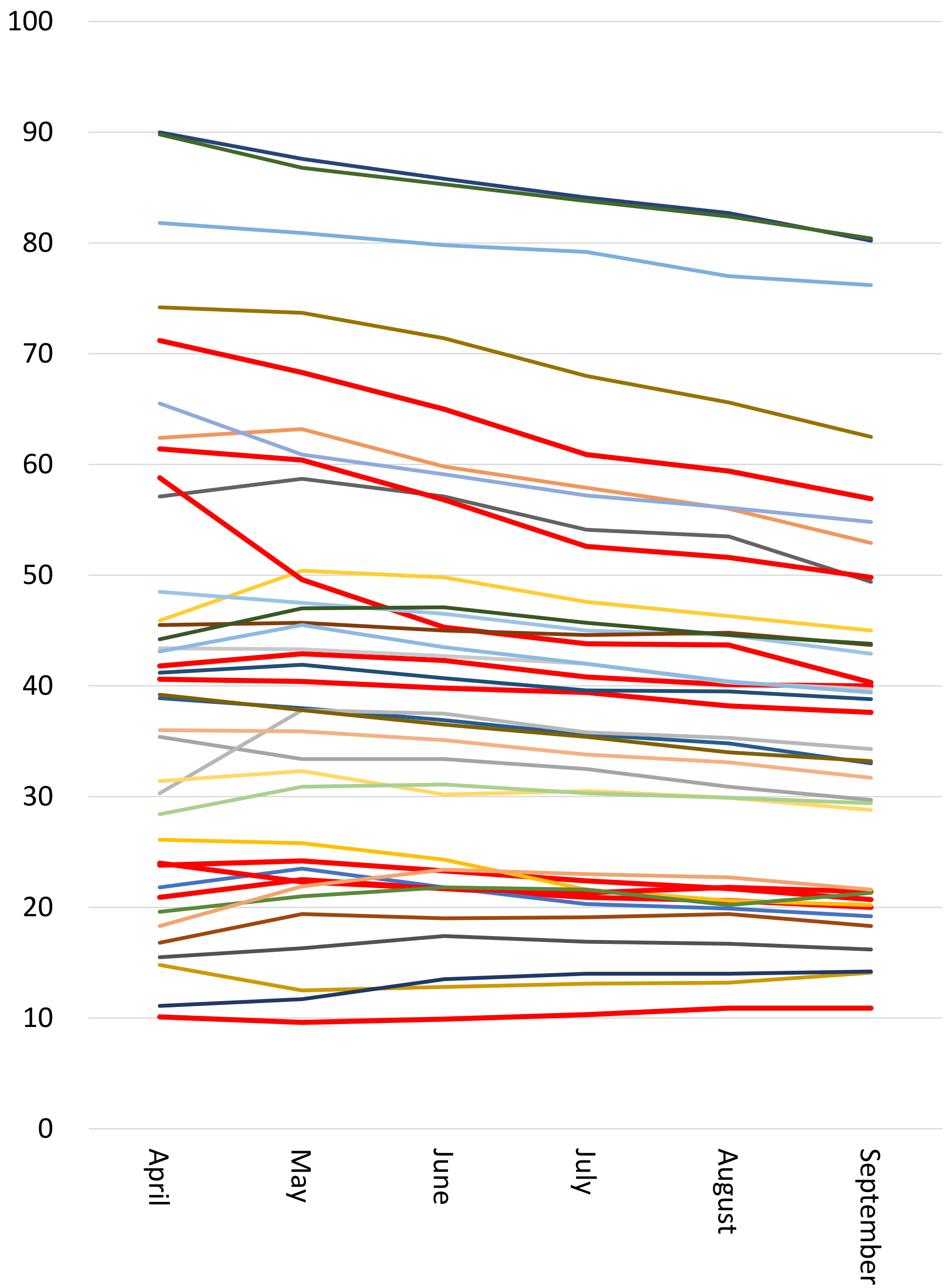
Travel restrictions have resulted in various negative impacts on people's lives!

Source: nation-wide questionnaire surveys by Junyi Zhang's lab

Temporal changes in travel behaviors and others in the UK

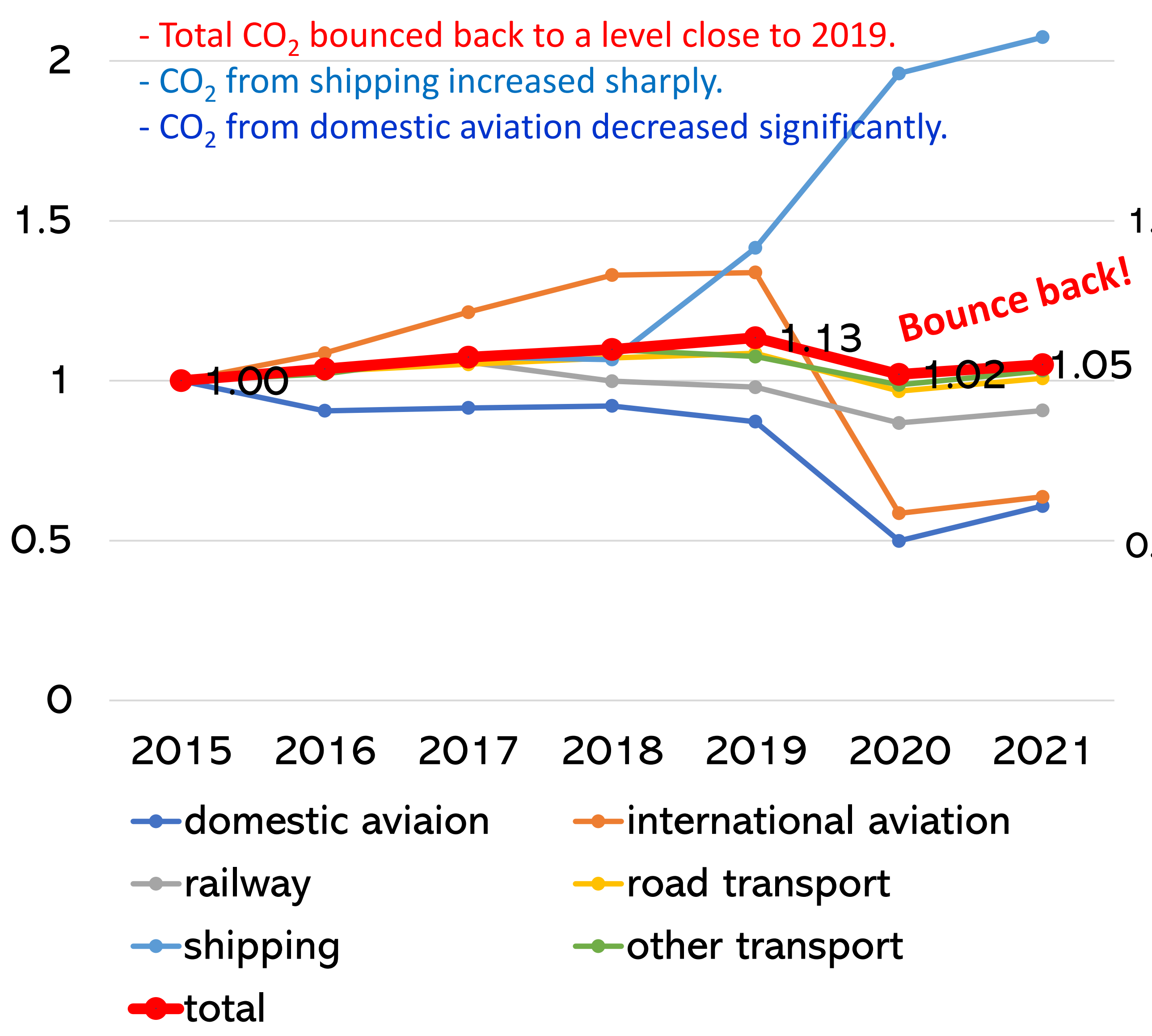


Temporal changes in travel behaviors and others in Japan

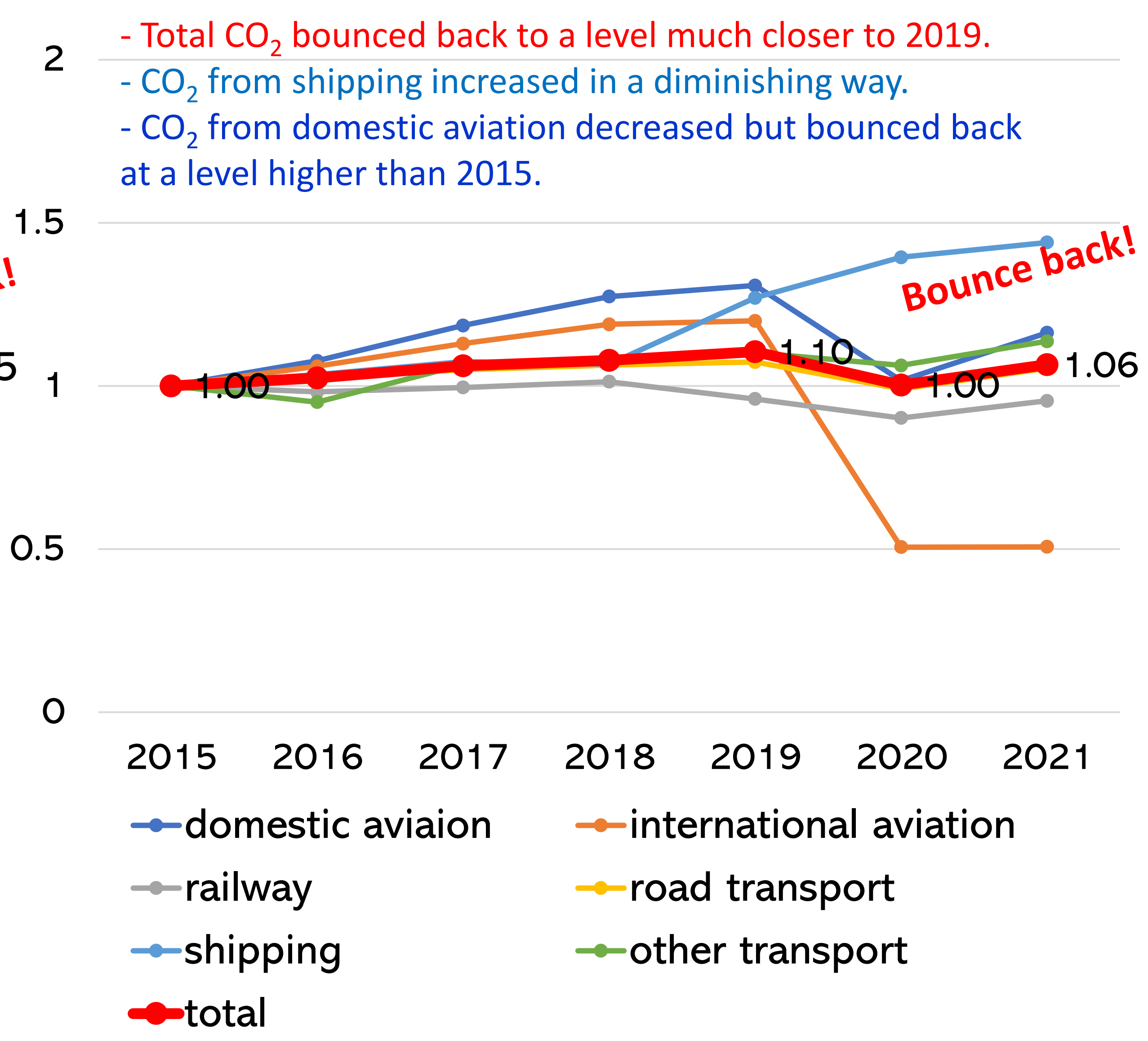


CO_2

Changes in CO_2 emissions by transport subsector: Global North (Relative to 2015)



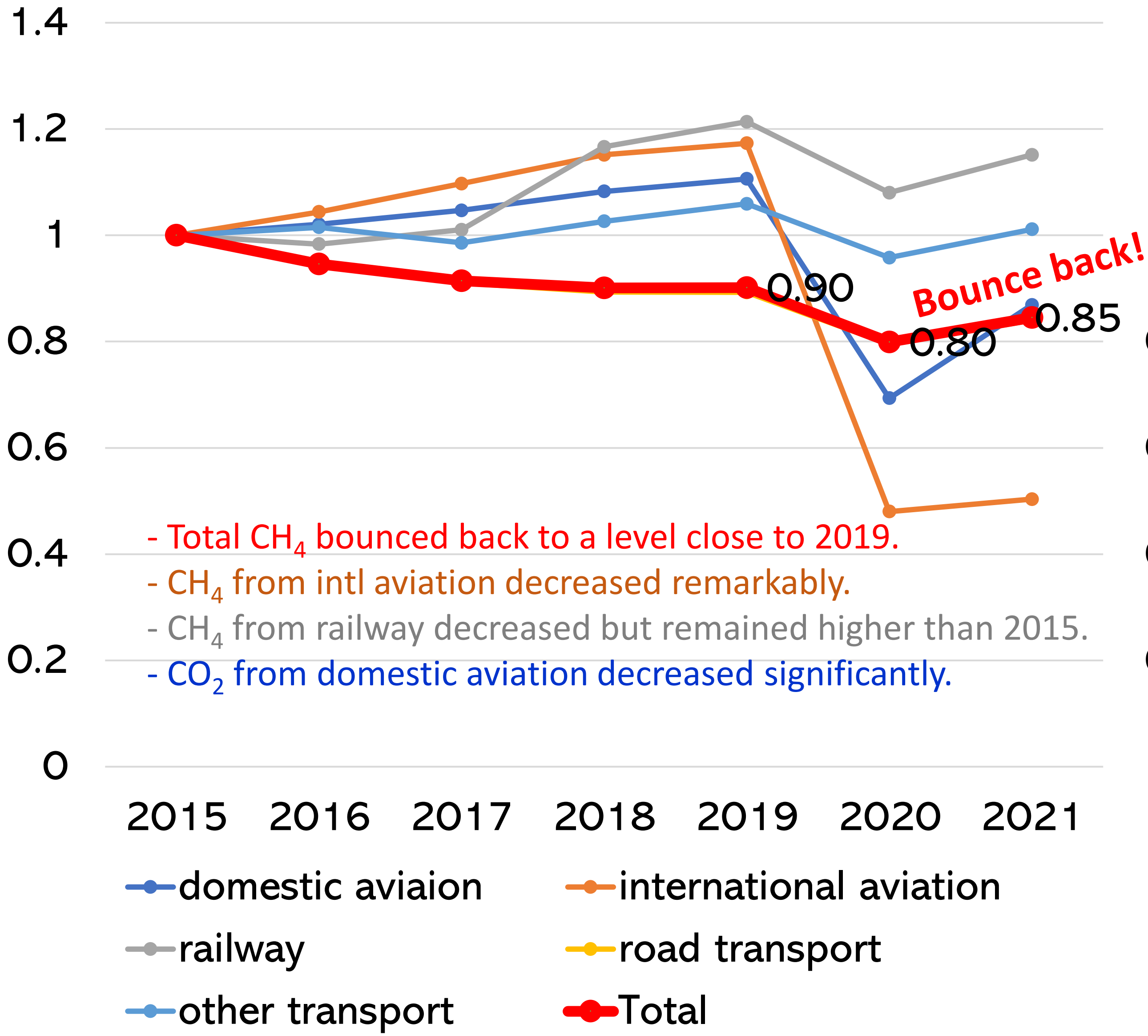
Changes in CO_2 emissions by transport subsector: Global South (Relative to 2015)



Joint works with Bailing Zhang (Doctoral candidate) and Jing Kang (Assis. Prof.), Hiroshima University

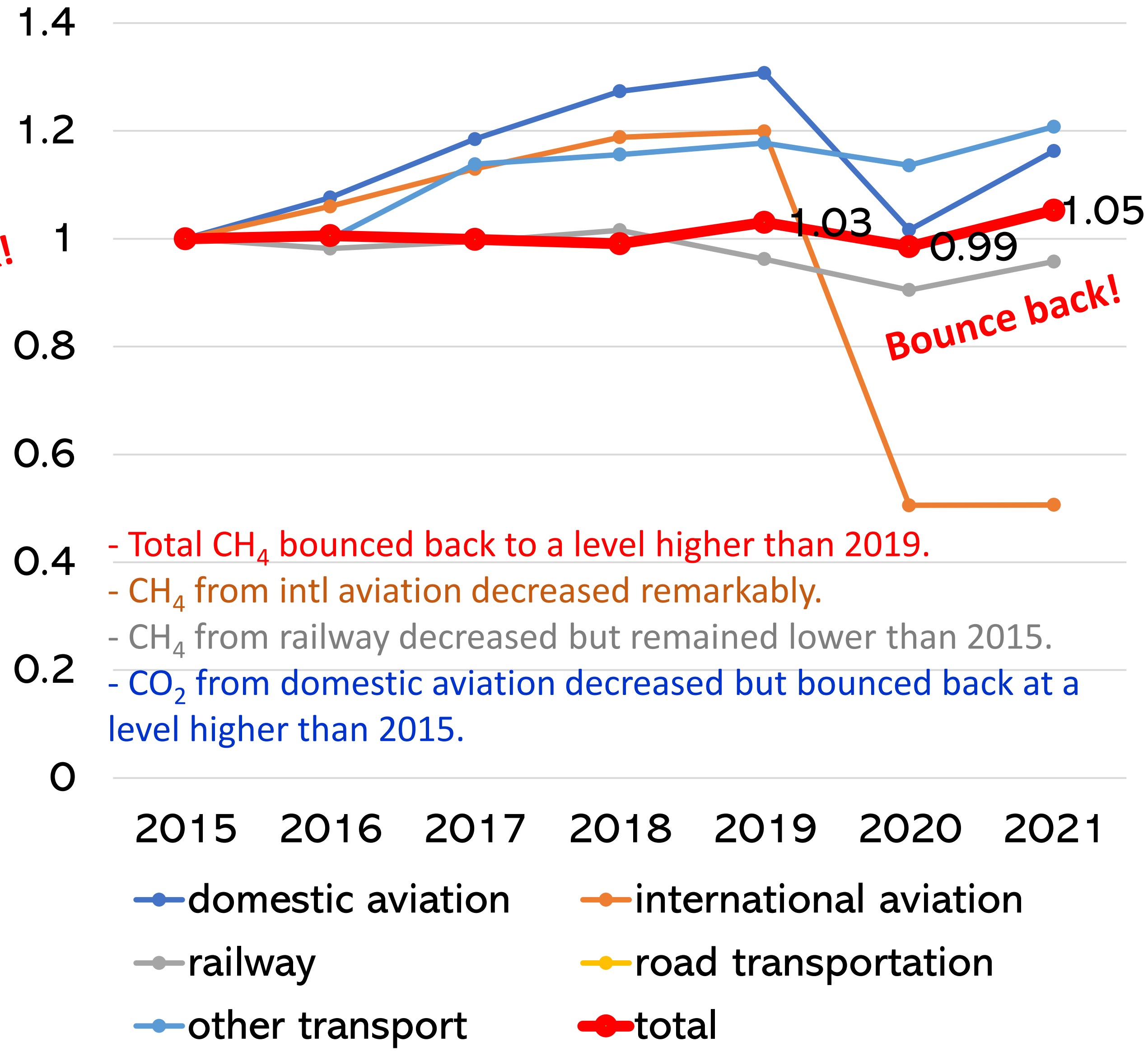
CH_4

Changes in CH_4 emissions by transport subsector: Global North (Relative to 2015)



- Total CH_4 bounced back to a level close to 2019.
- CH_4 from intl aviation decreased remarkably.
- CH_4 from railway decreased but remained higher than 2015.
- CO_2 from domestic aviation decreased significantly.

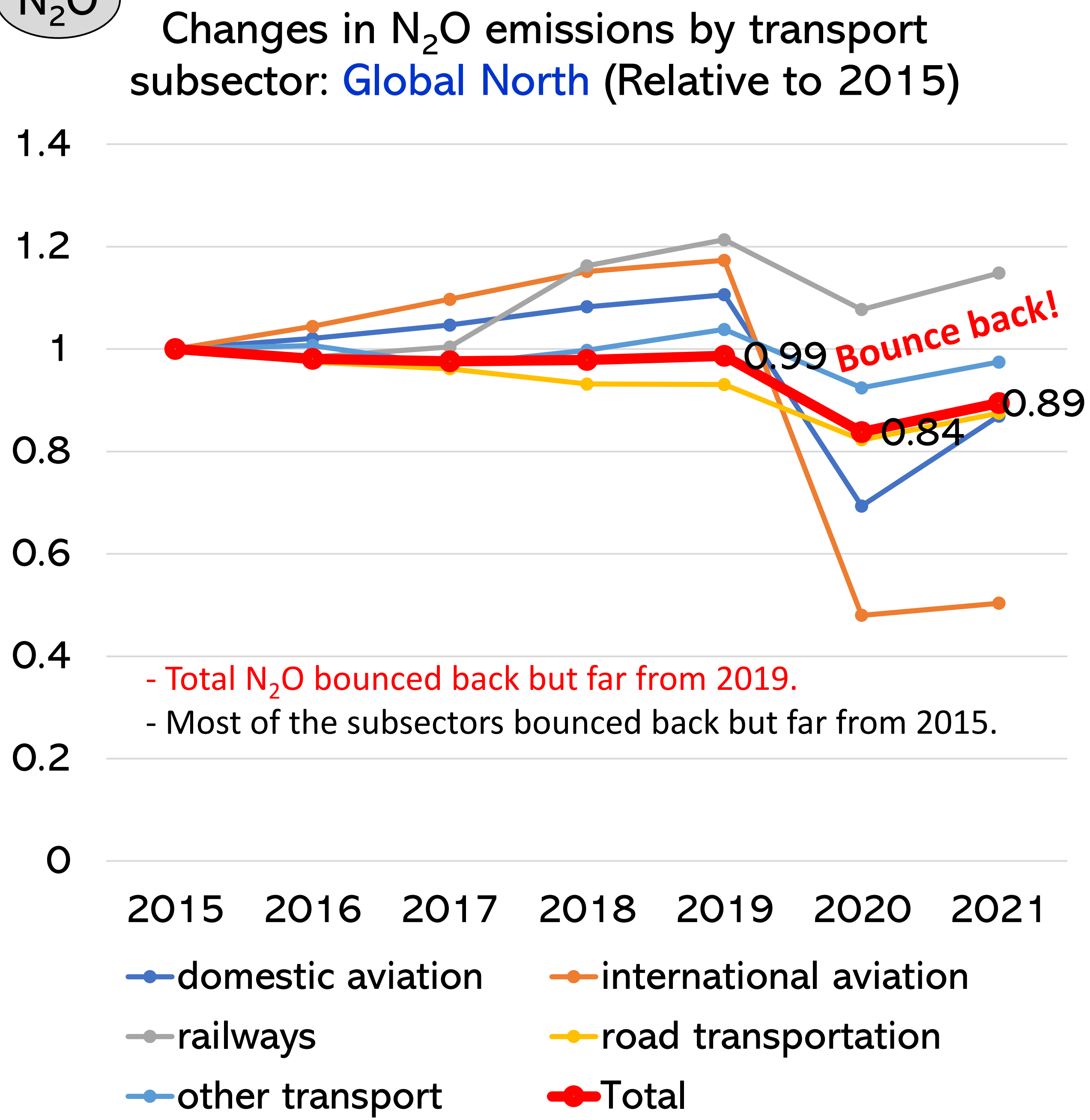
Changes in CH_4 emissions by transport subsector: Global South (Relative to 2015)



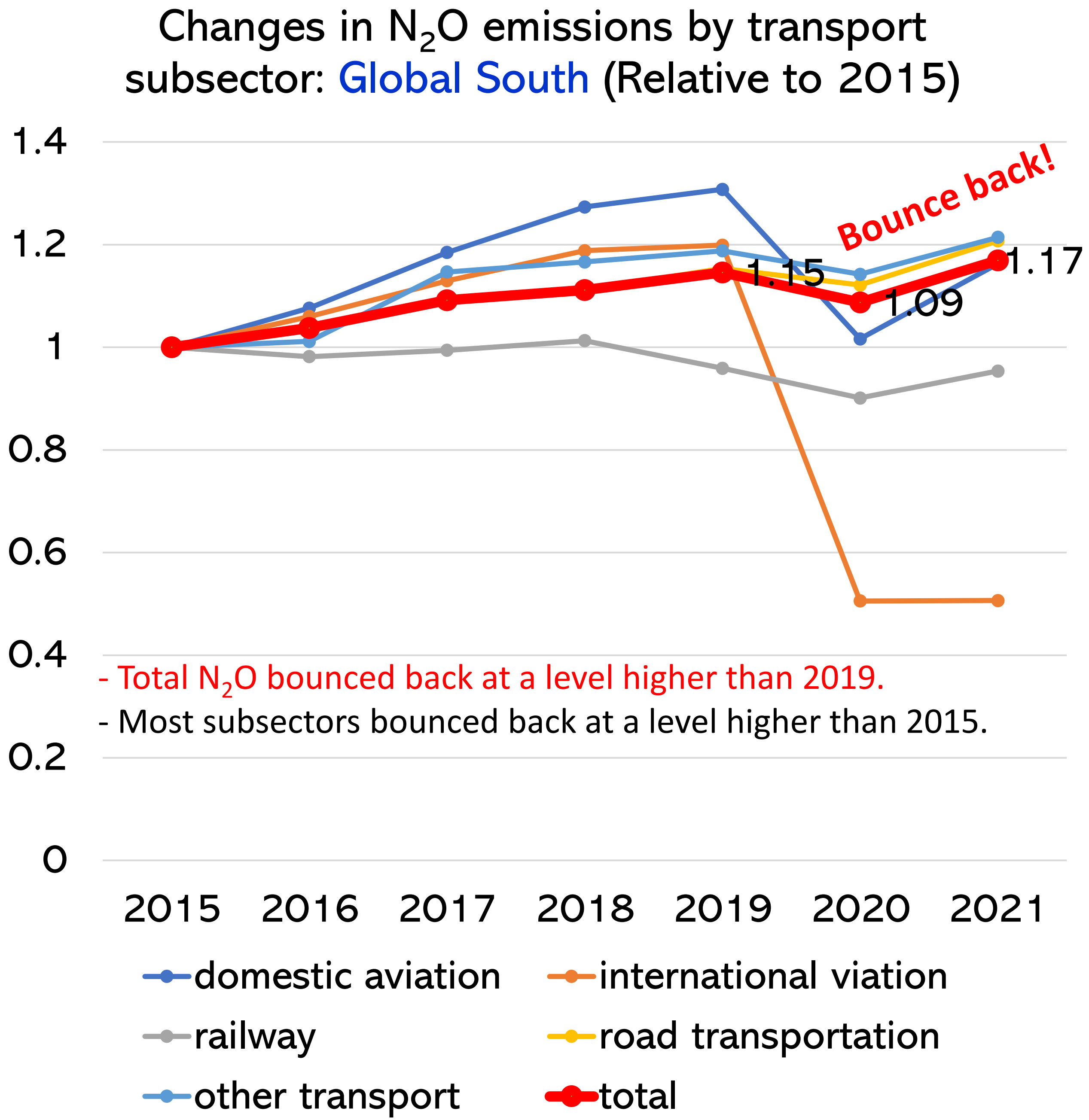
- Total CH_4 bounced back to a level higher than 2019.
- CH_4 from intl aviation decreased remarkably.
- CH_4 from railway decreased but remained lower than 2015.
- CO_2 from domestic aviation decreased but bounced back at a level higher than 2015.

Joint works with Bailing Zhang (Doctoral candidate) and Jing Kang (Assis. Prof.), Hiroshima University

N_2O



- Total N_2O bounced back but far from 2019.
- Most of the subsectors bounced back but far from 2015.



- Total N_2O bounced back at a level higher than 2019.
- Most subsectors bounced back at a level higher than 2015.

Joint works with Bailing Zhang (Doctoral candidate) and Jing Kang (Assis. Prof.), Hiroshima University

Future directions

From SDGs to Harmonized Development Goals

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https://home.hiroshima-u.ac.jp/~zjy/wp-content/uploads/2021/10/Harmonization-Science_Proposed-in-Sept-2020-2.pdf

Harmonized Development Goals (HDGs)

Junyi Zhang (2020.09)
Harmonization Science

Sustainable Development Goals (HDGs)

Millennium Development Goals (MDGs)

Well-harmonized
vs.
Less-harmonized

Developed
vs.
Developing

Now, it is a critical time to re-define the long-existing country classification!

e.g., post-pandemic scenario: thoughtful 2020s

- Harmonizing with nature
- Harmonizing with life

Werner Rothengatter, Junyi Zhang, Yoshitsugu Hayashi, Anastasiia Nosach, Kun Wang, Tae Hoon Oum (2021) Pandemic waves and the time after Covid-19 – Consequences for the transport sector, Transport Policy, 110, 225-237

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To promote Planetary health: Co-health of individuals, society and nature

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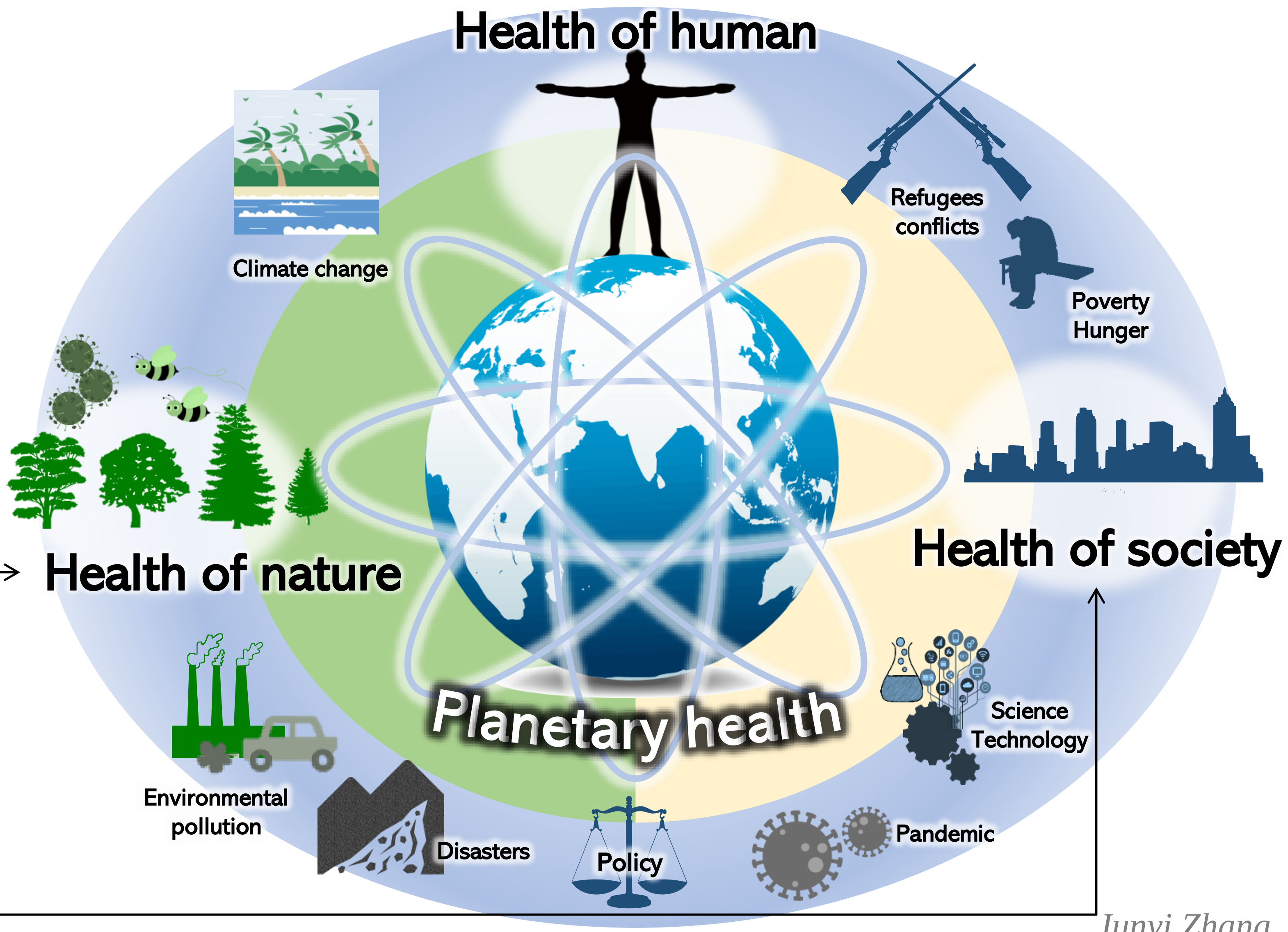
Human health effects

Mediating factors
Culture and behavior
Technology
Philanthropy
Wealth
Governance

Proximate causes
Air quality
Food production
Infectious disease exposures
Access to fresh water
Natural hazards

Ecological drivers
Biodiversity loss, resource scarcity
Worsened biogeochemical cycles
Global pollution
Climate change

Underlying drivers
Consumption
Demographic shifts
Technology



Modified based on https://www.thelancet.com/action/showPdf?pii=S0140-6736%2817%2932846-5

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A "Transport in All Policies" approach is required!

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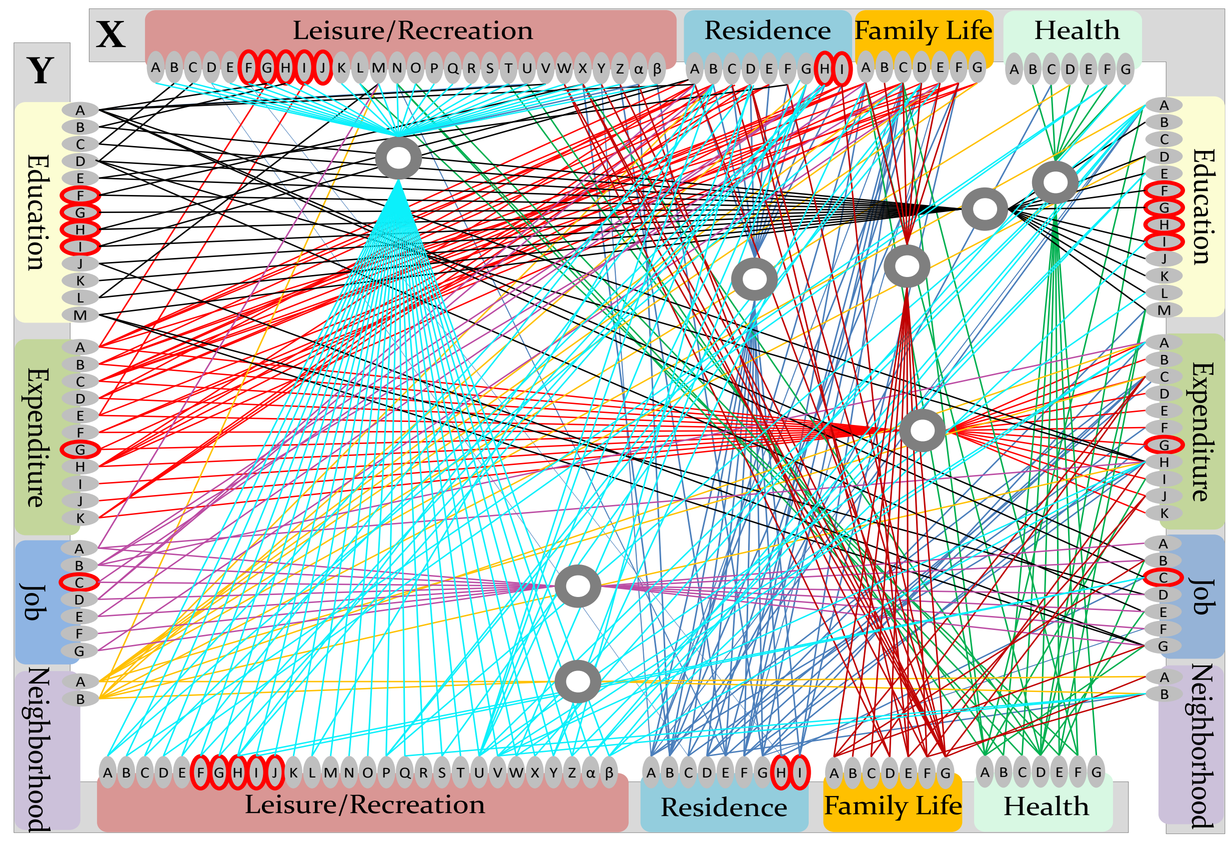
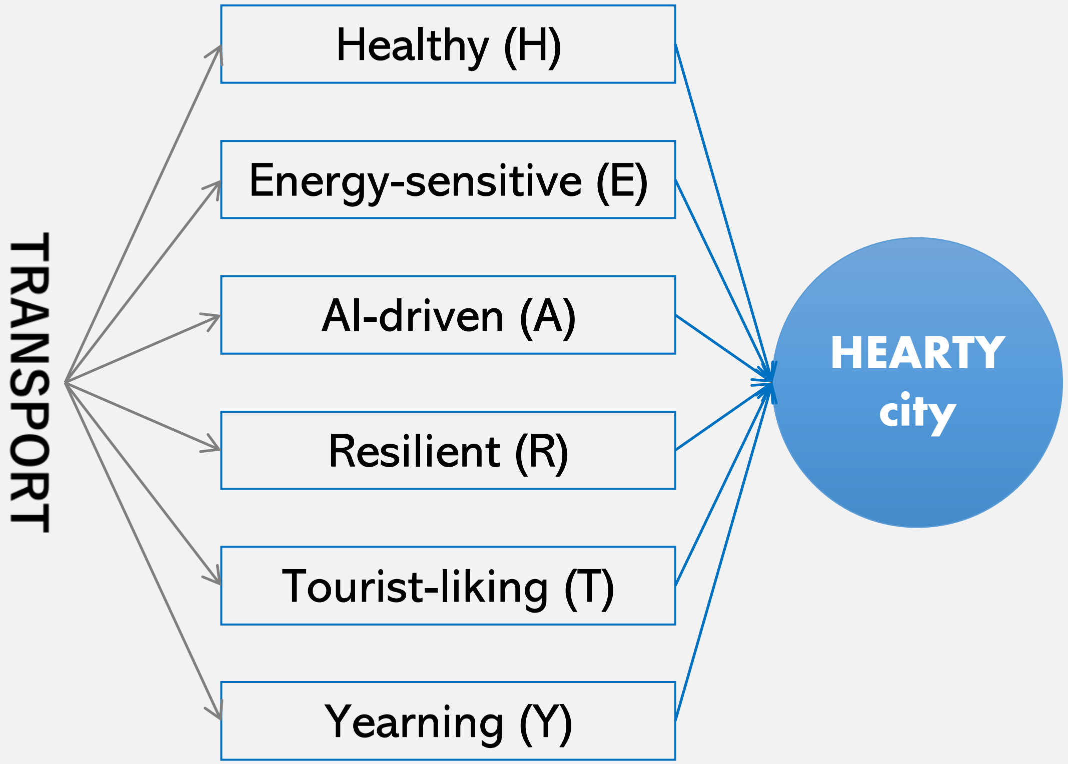
Transport is closely connected with people's daily lives!



The life-oriented approach (proposed by Junyi Zhang in 2010) has revealed various interdependencies across life domains.

Transport is closely connected with many policy goals!



HEARTY City: A new urban/regional development concept proposed by Junyi Zhang in 2022.

Junyi Zhang