Why waste the waste?

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4.4 million square kilometres

3% of the total land area

625

million

8.8%

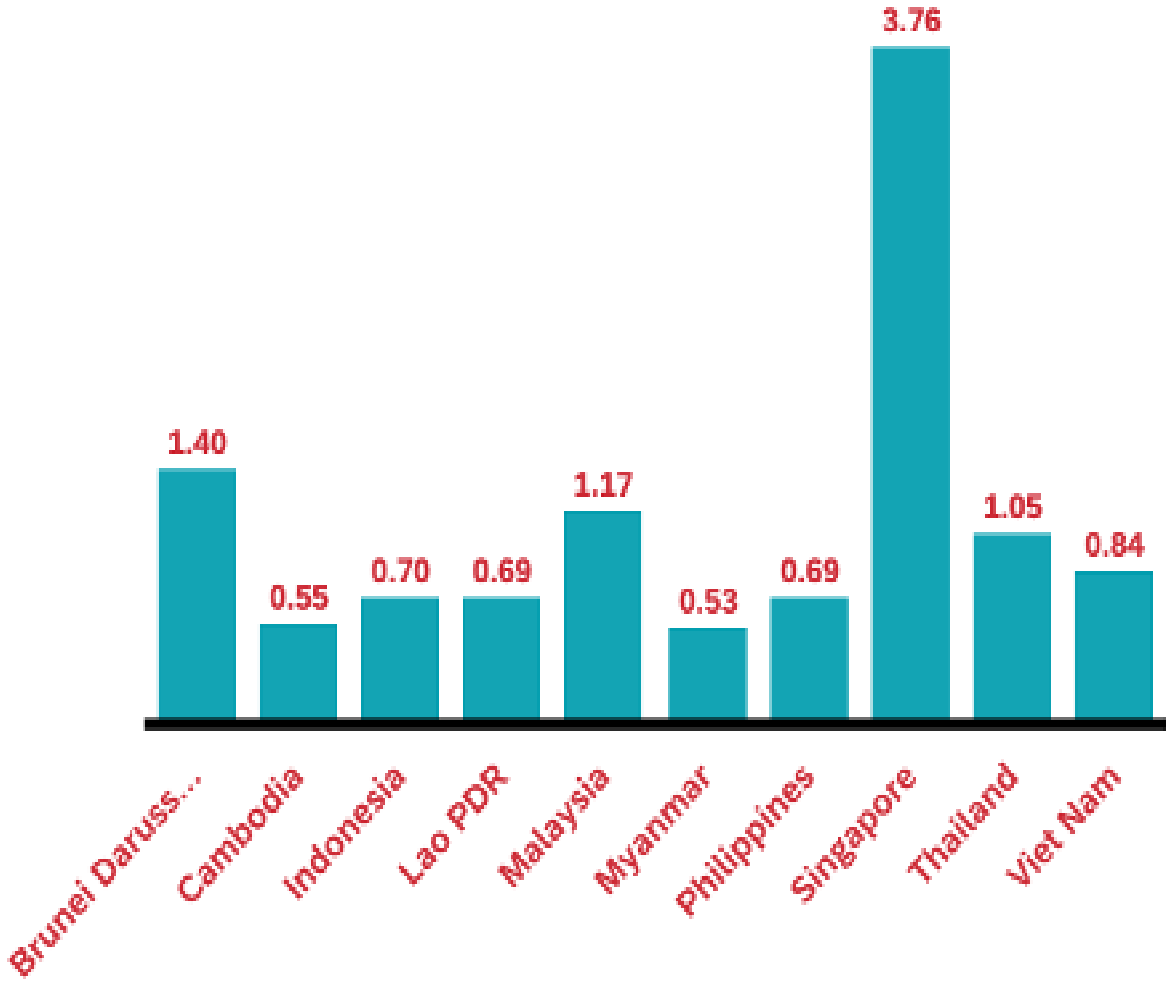
of world population

ASEAN Population

Municipal Solid Waste (MSW) Generation in ASEAN

1.14 kg/capita/day

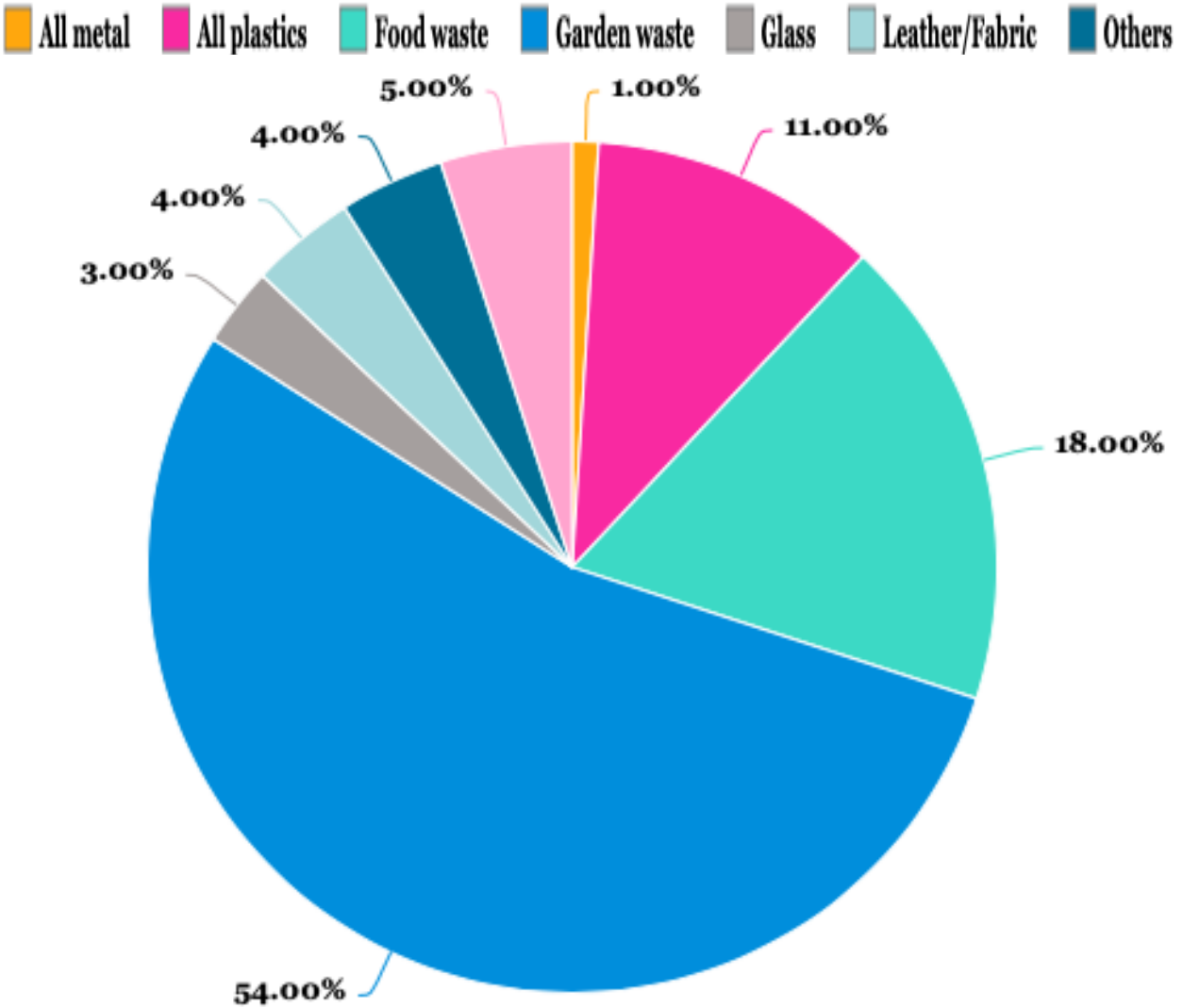
MSW Generation (kg/capita/day) per Countries



Annual MSW Generation (In ton) per Countries

Source: UN Summary Report (2017)

% of weight per Type of Wastes



Source: Digging Through by F. Jeske, et.al. (2017)

% of Garden/ Organic Waste per Countries

Source: UN Summary Report (2017)

Countries	Source Segregation	Treatment/ Disposal				
		Composting	Incineration	Sanitary Landfill	Open Dump	Open Burning
Brunei Darussalam	< 50 %					
Cambodia	< 50 %					
Indonesia	< 50 %					
Lao PDR	< 50 %					
Malaysia	< 50 %					
Myanmar	50 %					
Philippines	50 % - 70 %					
Singapore	70 %					
Thailand	< 50 %					
Viet Nam	< 50 %					

Source: UN Summary Report (2017)

How does open trash burning affect the environment?

Release of –

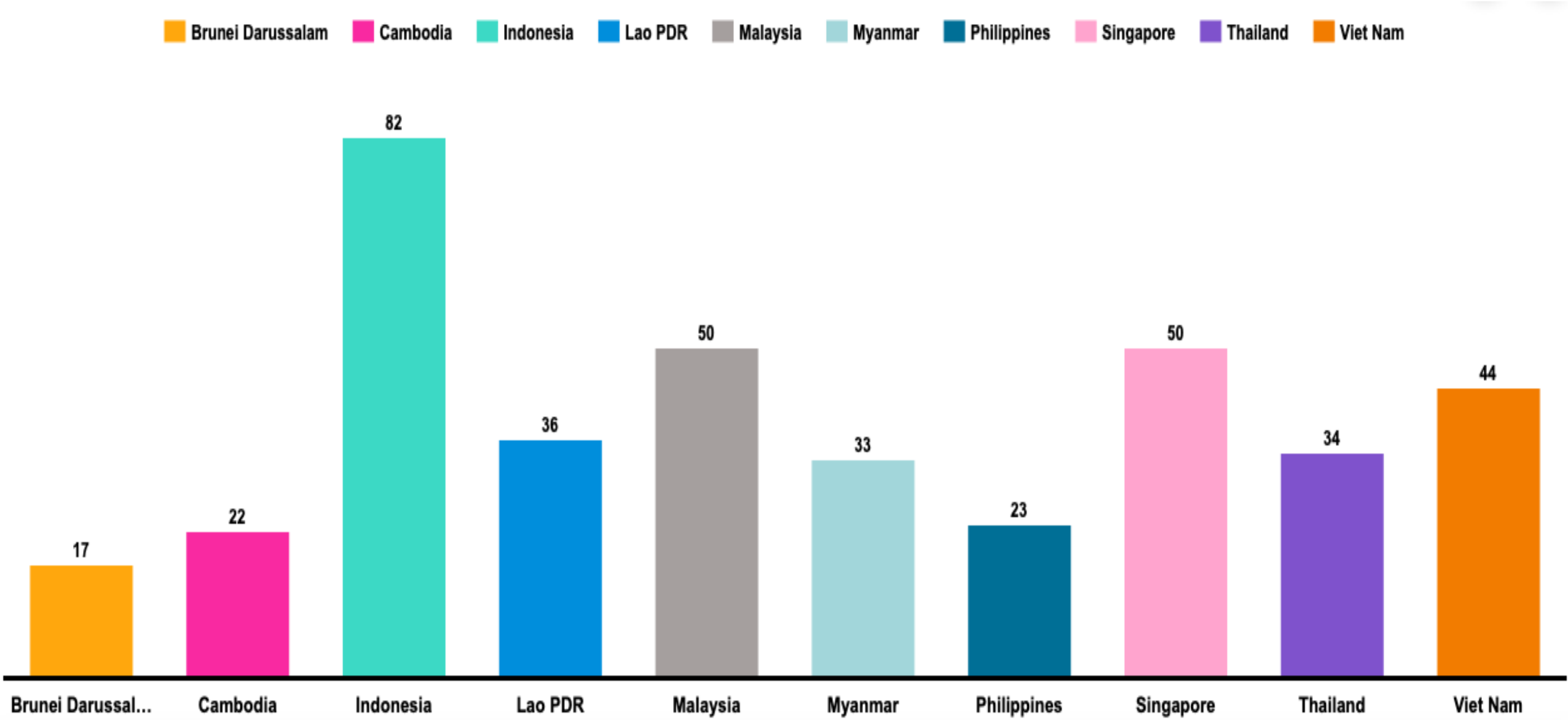
- toxins
- carbon dioxide and other greenhouse gases
- soot and other aerosols

Burning leaves – a quick solution?

Substantial emissions of –

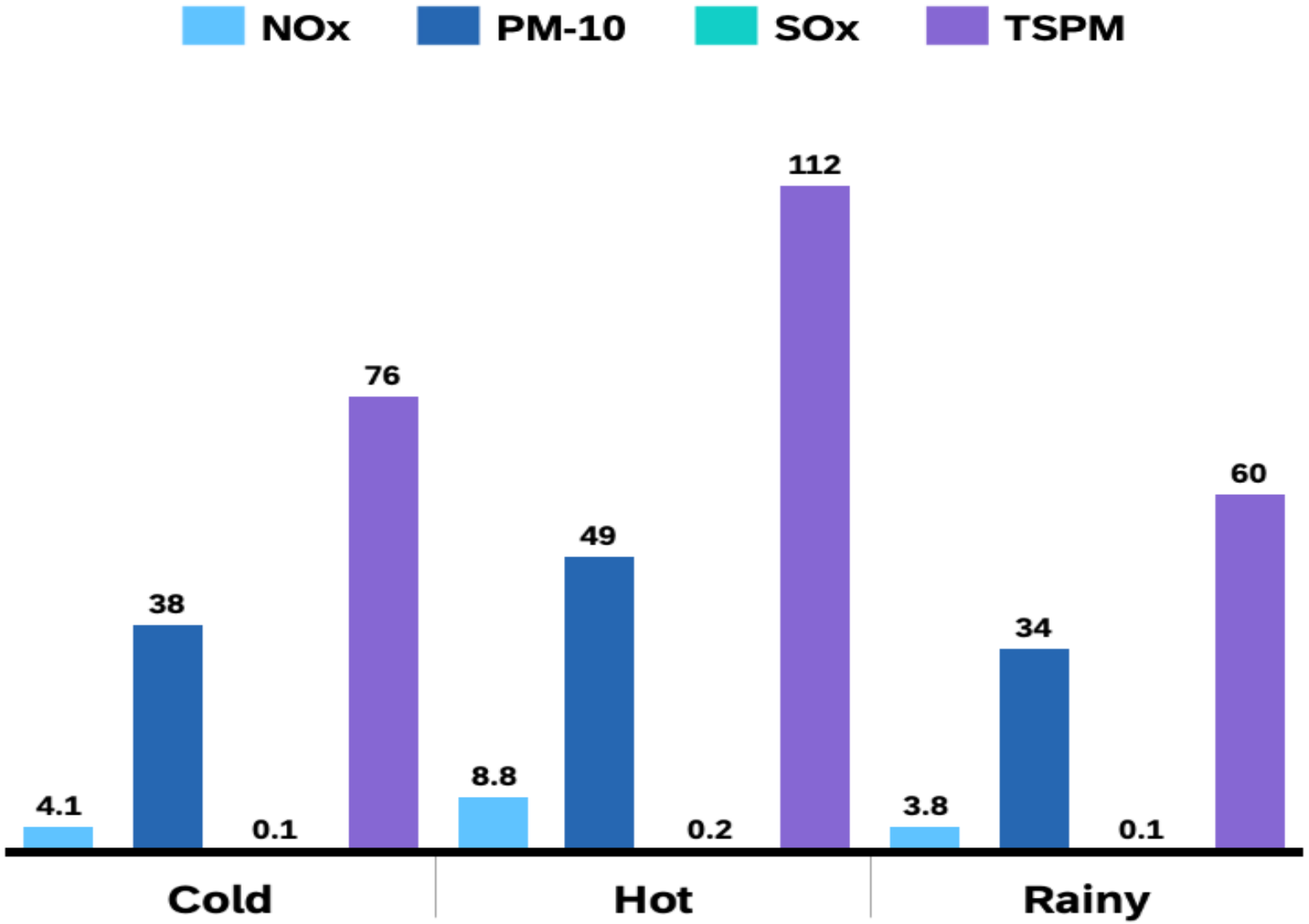
- particulate matter
- volatile organic compounds (VOCs)
- a wide range of toxic pollutants including cancer-causing dioxins

$PM_{2.5}$ Concentration per Countries



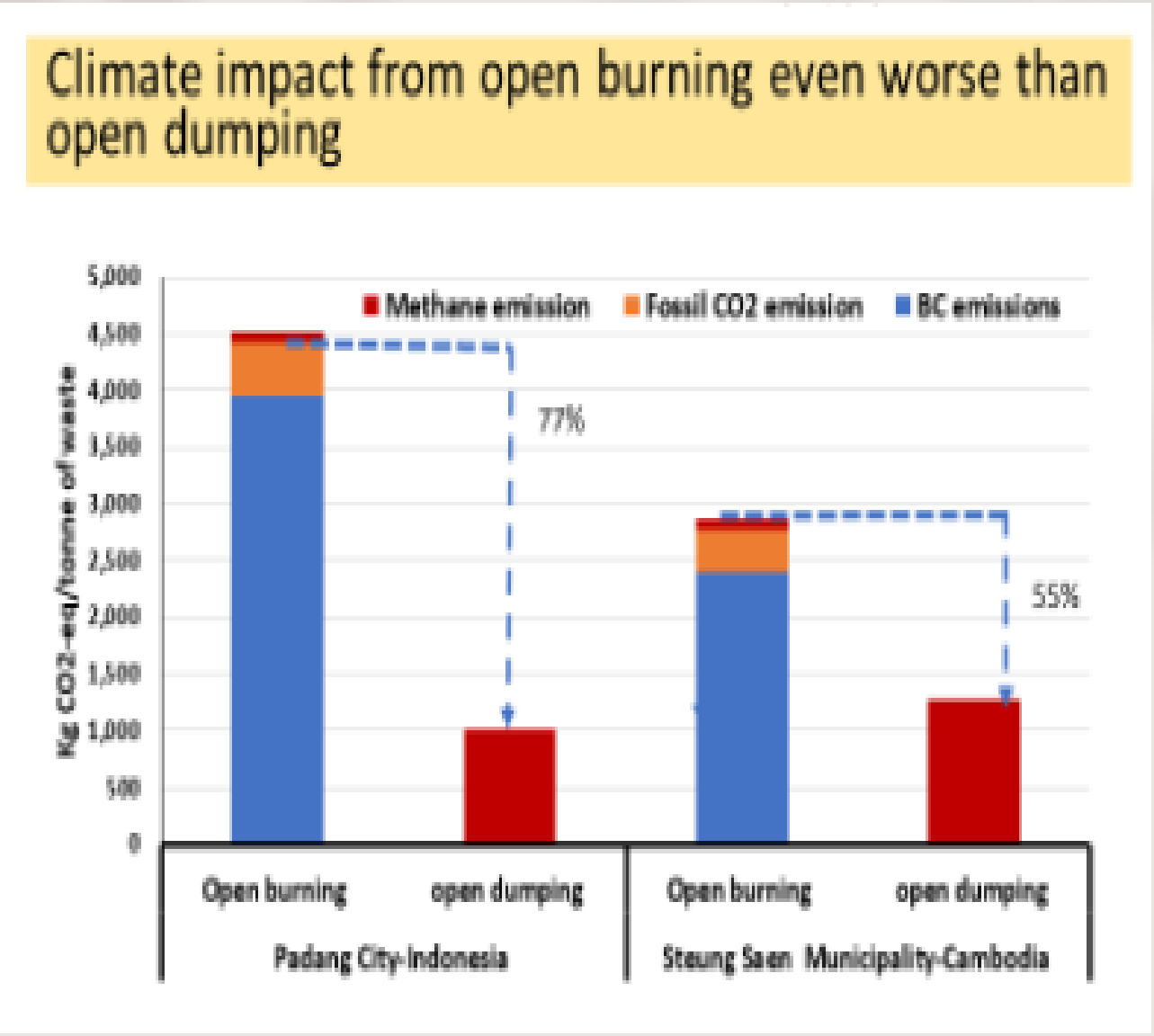
Source: Air Quality Life Index (2021)

NOx, PM-10 and others per Seasons



In **2018**

Source: Swe Swe Ohn, PhD Dissertation, UY. (2021)



Source: Summary of Open Waste Burning (2022)

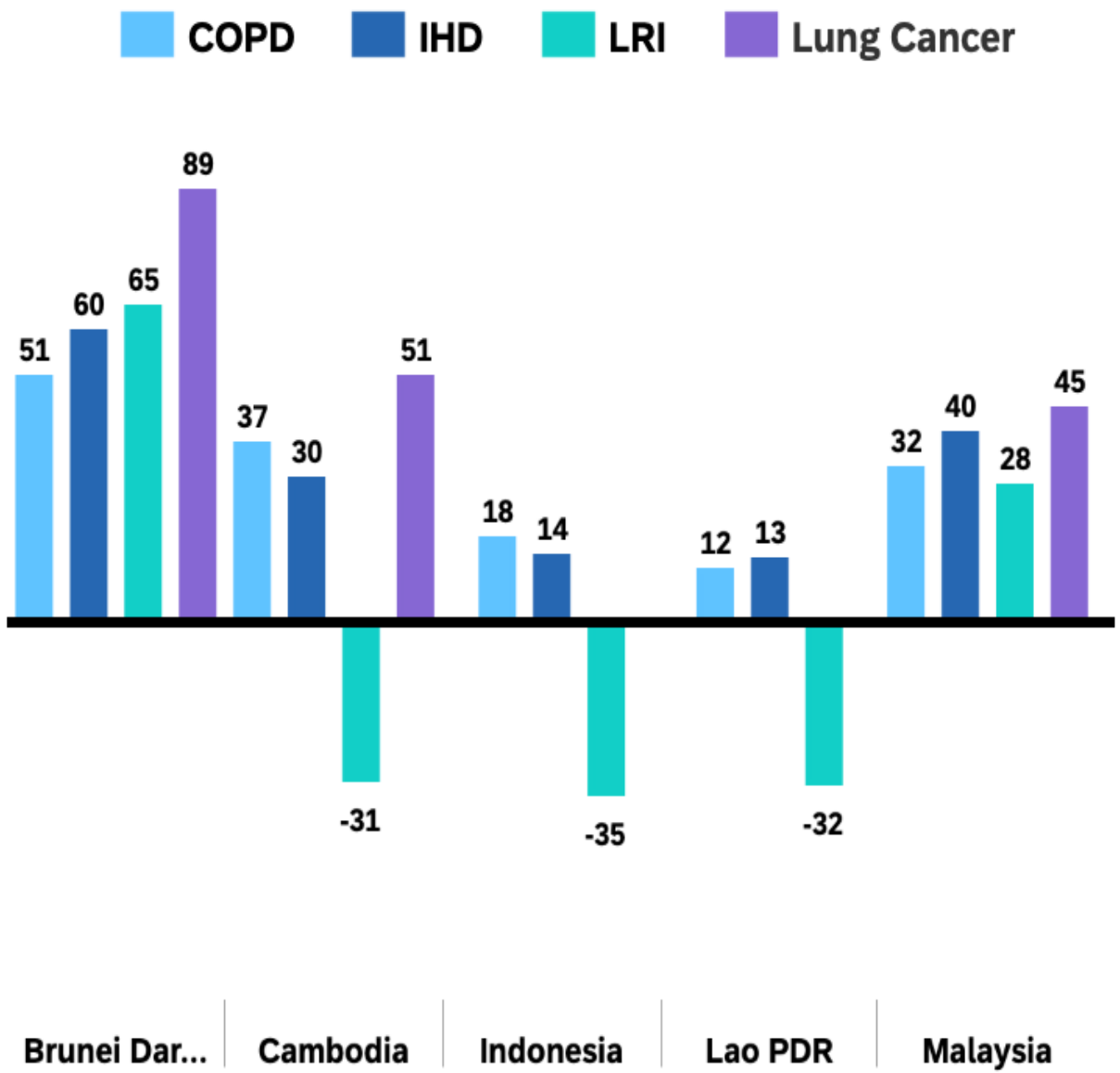
- **95.1 %** of estimated climate impact is caused by burning of waste at household level. (Dr. Rizki Aziz)
- **43.7%** of estimated climate impact is caused by burning of waste at final disposal site. (Mr. Uch Rithy)
- **77 % and 55 % more than** GHG and SLCP emissions are resulted if waste is openly burned, compared to openly dumped. (Dr. Nirmala Menikpura)

Effects on human body

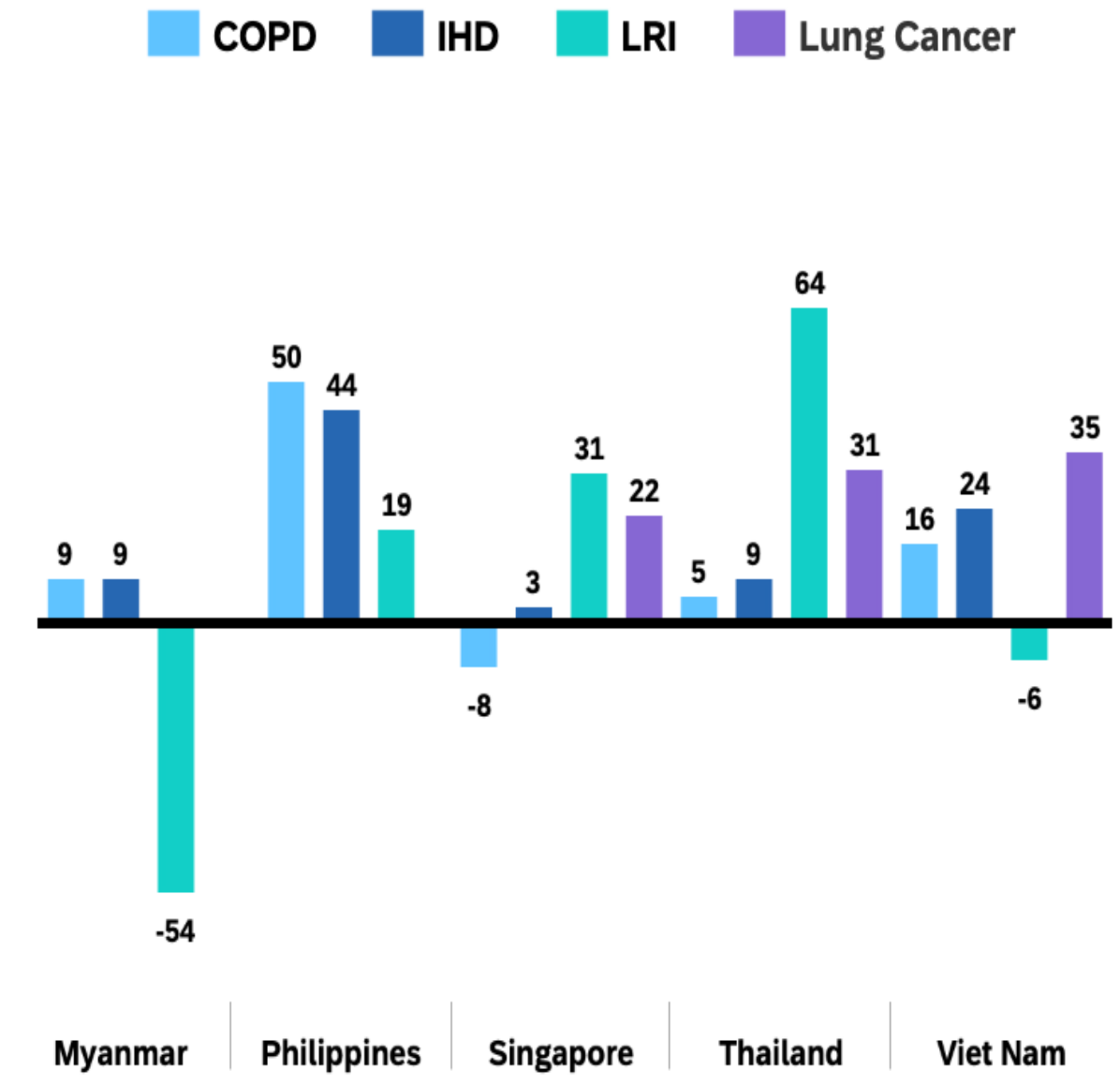
Large amount of airborne particulates and hazardous chemicals –

- fine bits of dust, soot and other solid materials released from leaves burning
- carbon monoxide
- benzo(a) pyrene

COPD, IHD and others per Countries



COPD, IHD and others per Countries



Source: UN Environment Foresight Brief (2018)

What if we reduce open burning?

Reducing trash burning is estimated to reduce up to 40% of air pollution in LMIC (Low- and Middle-Income Countries) urban areas.

What can we do to reduce open burning?

Our recommendation

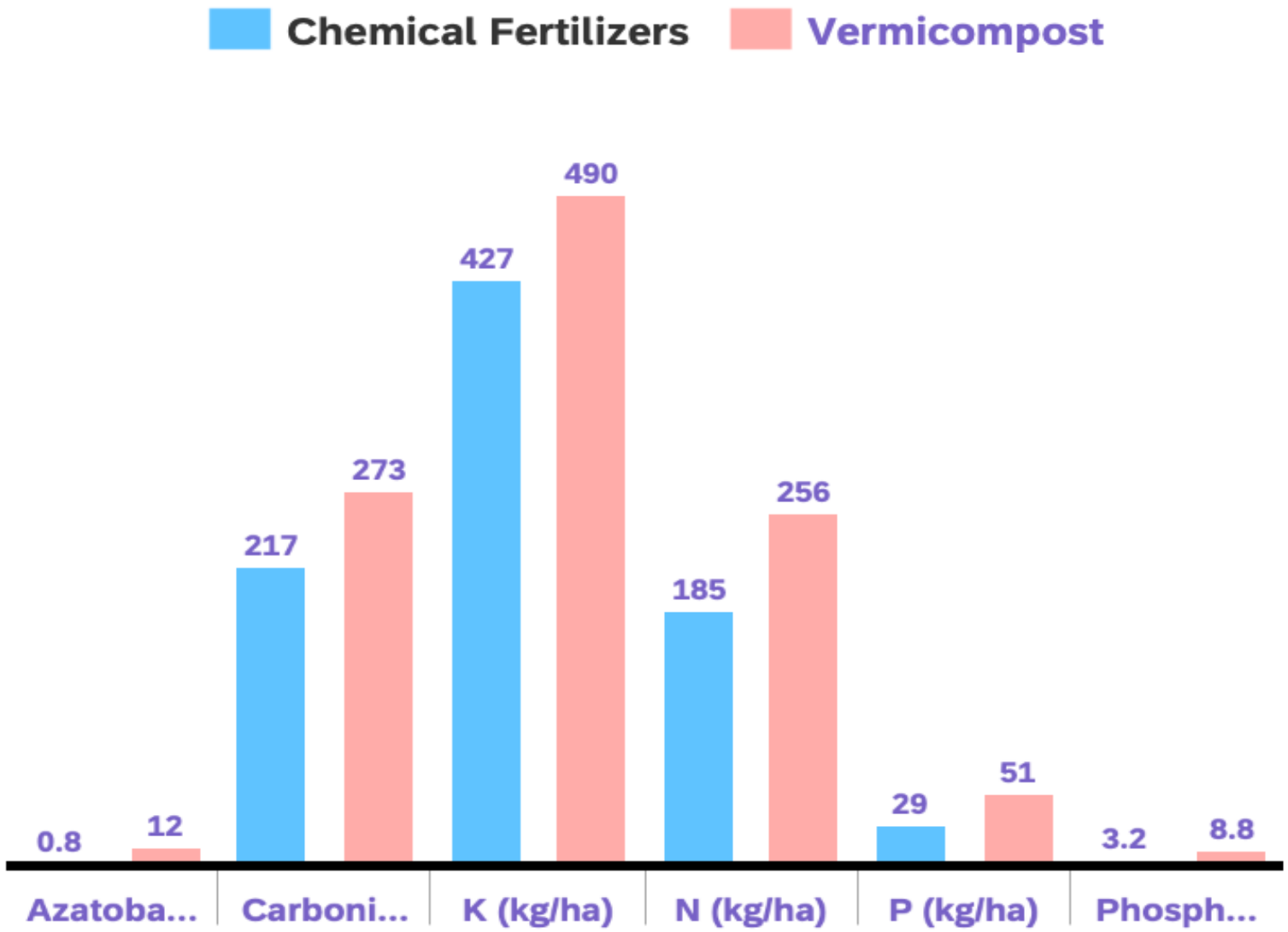
Vermiculture or Vermicomposting – extracting gold from garbage

What is 'Vermiculture' or 'Vermicomposting'?

- a method of composting using worms to produce vermicompost, which are worm castings or manure

- a clean, sustainable, and **zero-waste** approach

Chemical Fertilizers, Vermicompost per Chemical & Biological Properties of Soil



Chemical & Biological Properties of Soil
Azatobacter (1000/gm of soil)
Carbonic Biomass (mg/kg of soil)
K (kg/ha)
N (kg/ha)
P (kg/ha)
Phospho Bacteria (100,000/kg of soil)

Source: R. K. Sinha, et.al. Agricultural Science (2010)

Can any type of worm be used?

- Only a few species of worms can be used for vermiculture.
- It is important to choose the correct type of worms.

Suitable earthworm species for tropical regions

- *Eudrilus eugeniae*
  - native to tropical west Africa
  - also found in South Asia and Southeast Asia
- *Perionyx excavatus*
  - recently become more popular in North America for composing purposes
  - native to tropical East Asia, South Asia and Southeast Asia
- *Polypheretima elongata*
  - a new species found in Indonesia in 2017
  - *Polypheretima* – mainly distributed in Indo-Australian archipelago

Vermicomposting Farm for Urban Areas

a waste collection system where plant litters are collected and used for composting

a larger-scale composting

Preparation of containers

container of 10 ft x 5 ft x 3 ft

6 ft of cow manure, 8 ft of leaves and grass as bedding

another layer of cow manure, leaves, grass, chopped pieces of banana stems and soil

container cover

good ventilation and moisture

It should be noted that worms prefer moisture and moderate temperature.

It is important to spray water on the containers daily.

Create an opening and use a tap at the bottom to take out the water.

This water can be used as organic fertilizer as it is rich in nutrients for the plants.

Vermicomposting Farm for Urban Areas

Step 1 buy and collect plant litters

Step 2 send the litters to the farm

Step 3 dump plant litters into prepared containers

Vermicomposting Farms for Urban Areas

Step 4

Spray water and keep the container ventilated.

Step 5

Leave the container for around three months.

Step 6

Take out the composts.

What benefits can vermicomposting bring?

1. Reduces open leaves burning

- reduce open leaves burning in urban areas, and even in rural areas
- mitigate the effect of leaves burning on **air quality**
- can even be an option to reduce **transboundary haze pollution**

2. Environmentally friendly

Nutrients	Vermicompost	ICRISAT
Nitrogen	1.12%	0.5 - 1.6 %
Phosphorus	0.64%	0.2 - 1.0 %
Potassium	0.62%	0.2 -0.7 %
Ca	0.71%	0.5 - 1.5 %
Mg	0.39%	0.1 - 0.6 %
Organic Matter	63.43%	25 - 80 %
Moisture Content	63.10%	32 - 66 %
C : N	26.24	25 -35
pH	6.8	7

Source: Seinn Lei Aye, Research Project, UY. (2011)

2. Environmentally friendly

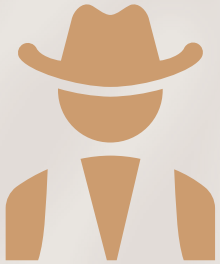
If we can raise awareness on the benefits of vermicomposting and provide proper guidance and support to farmers to do vermicomposting, it can even lead to **circular economy**.

3. Creates more job opportunities

For the Vermicomposting Farms in urban areas, we'll need:

plant litter collectors

workers at the farm



More job opportunities are created.

Challenges and constraints

- the need of more research in the field of vermicomposting
- agricultural policy and support service systems
- practical application of vermicomposting
  - worm breeding and worm training
  - lack of awareness and proper knowledge regarding vermicomposting

Our recommendation supports:

- SDG 11
  - SDG 11.6

    By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
    - SDG 11.6.1

      Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities

Our recommendation supports:

- SDG 12
  - SDG 12.8
  - By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature.
  - SDG 12.a.1
  - Amount of support to developing countries on research and development for sustainable consumption and production and environmentally sound technologies

Our recommendation supports:

- SDG 13
  - SDG 13.b
  - Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

Our recommendation supports:

- Chapter II, C.1. of ASCC Blueprint

  ii. Strengthen regional cooperation on sustainable forest management in the context of forest fire prevention and control, including through the implementation of the ASEAN Agreement on Transboundary Haze Pollution, to effectively address transboundary haze pollution;

Our recommendation supports:

- Chapter II, C.3. of ASCC Blueprint

  i. Strengthen human and institutional capacity in implementing climate change adaptation and mitigation, especially on vulnerable and marginalised communities;

Our recommendation supports:

- Chapter II, C.4. of ASCC Blueprint

  ii. Promote environmental education (including eco-school practice), awareness, and capacity to adopt sustainable consumption and green lifestyle at all levels;

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Thank you for your time and attention!