Smart and Healthy Transportation Systems – VIP Project Progress Report Spring 2023

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Project Overview - Objectives

- **Long-term vision:** develop a systematic health impact assessment model that would allow DVRPC to incorporate health considerations into their long-range planning activities and other agency analysis.

- **Year-1 objective:** develop a roadmap to systematic health impact assessments for transportation systems, serving as a guide for Drexel and the DVRPC to continue research activities in subsequent years.

Project Overview – Year 1 Plan

1 Pathway

Identify pathways through which transportation system affects public health

2 Model

Review existing health impact models for transportation systems (e.g., ITHIM, HEAT)

3 Quantification

Investigate metrics to quantify the health impact through each pathway

4 Roadmap

Develop a roadmap to health impact assessment for transportation systems

Project Overview – Progress to Date

Pathway

Identify pathways through which transportation system affects public health

1

2

Model

Review existing health impact models for transportation systems (e.g., ITHIM, HEAT)

Quantification

Investigate metrics to quantify the health impact through each pathway

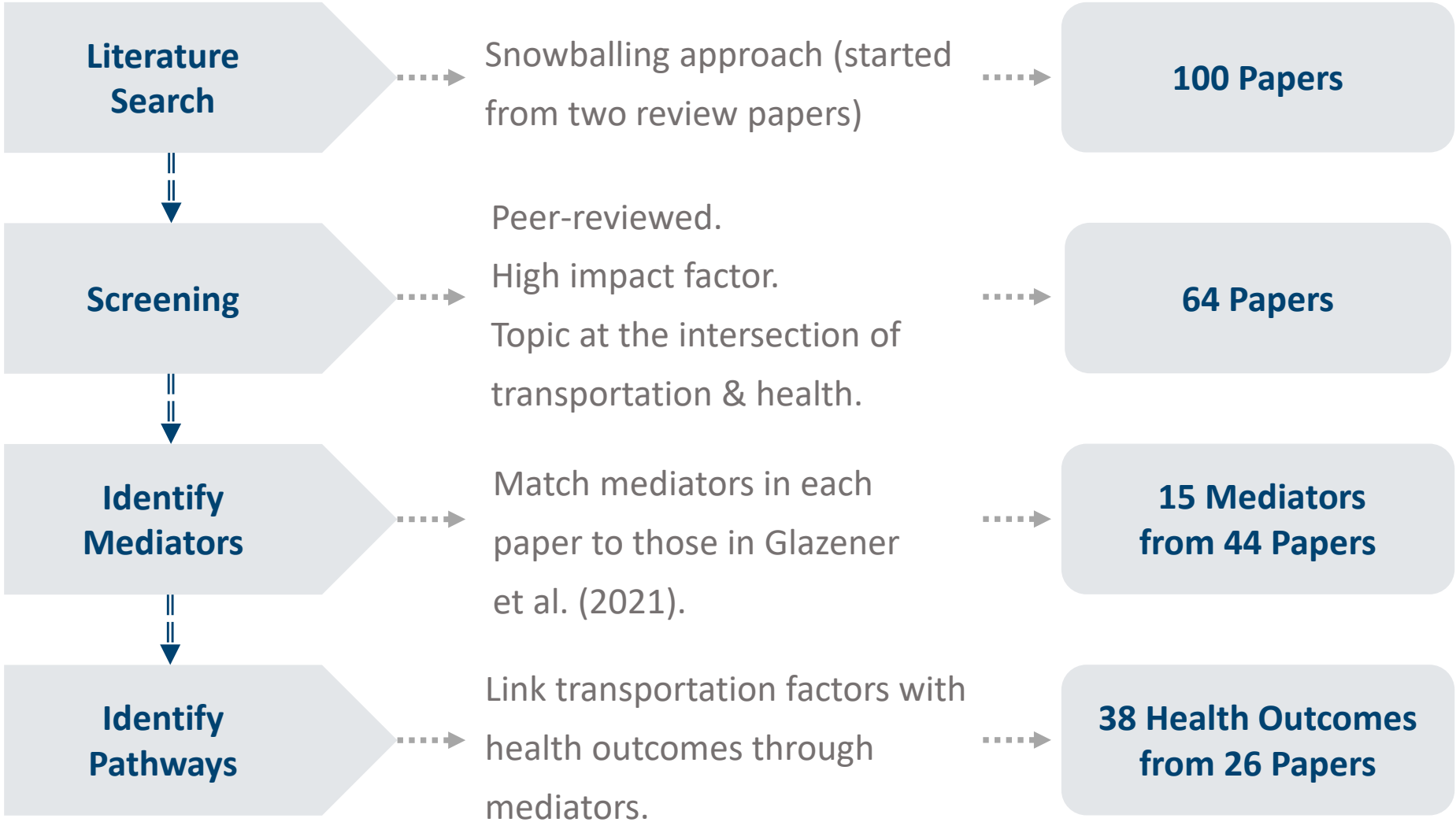
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Roadmap

Develop a roadmap to health impact assessment for transportation systems

Methods

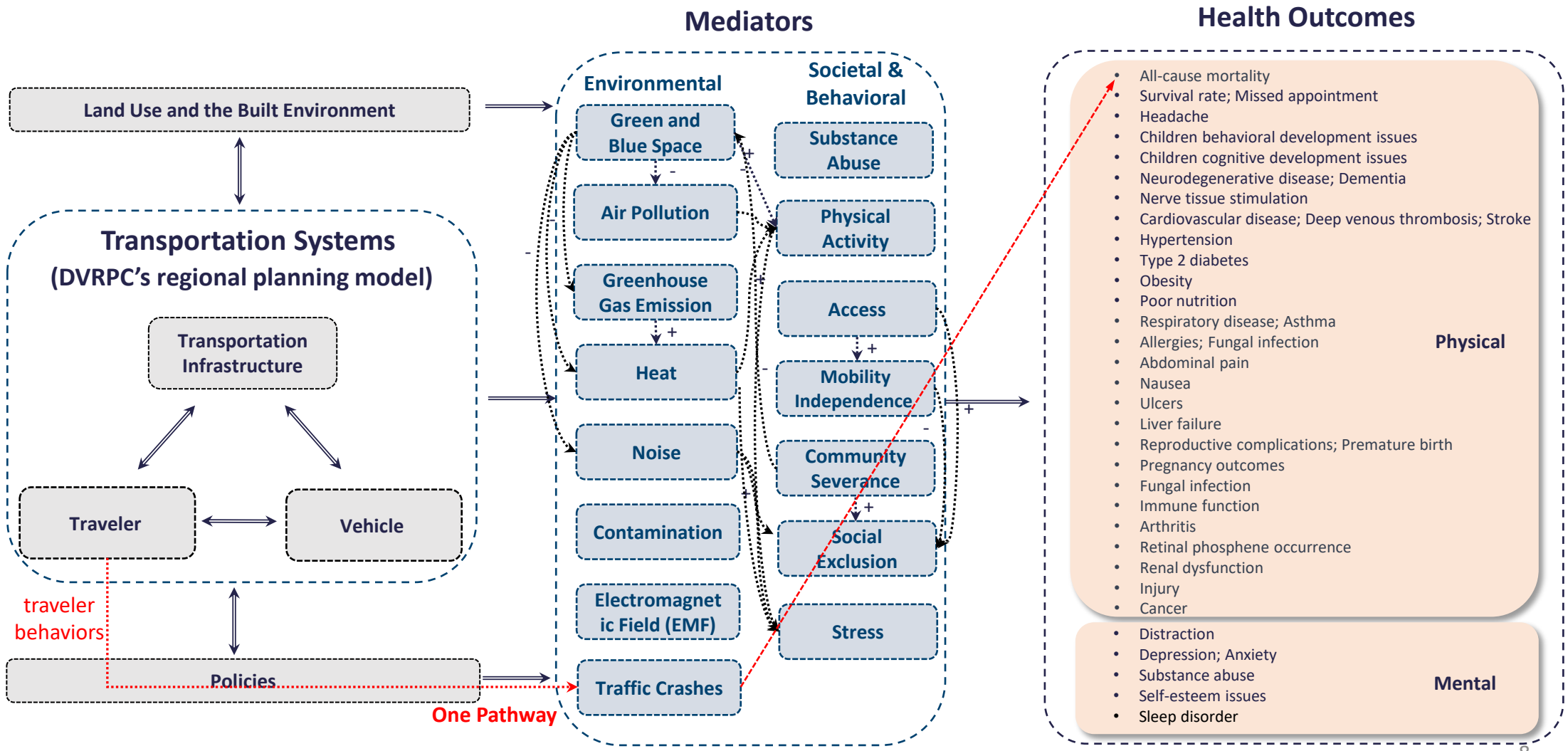


Glazener, A., Sanchez, K., Ramani, T., Zietsman, J., Nieuwenhuijsen, M.J., Mindell, J.S., Fox, M. and Khreis, H.,(2021). Fourteen pathways between urban transportation and health: A conceptual model and literature review. Journal of transport & health, 21, 101070.

Results: Summary Table

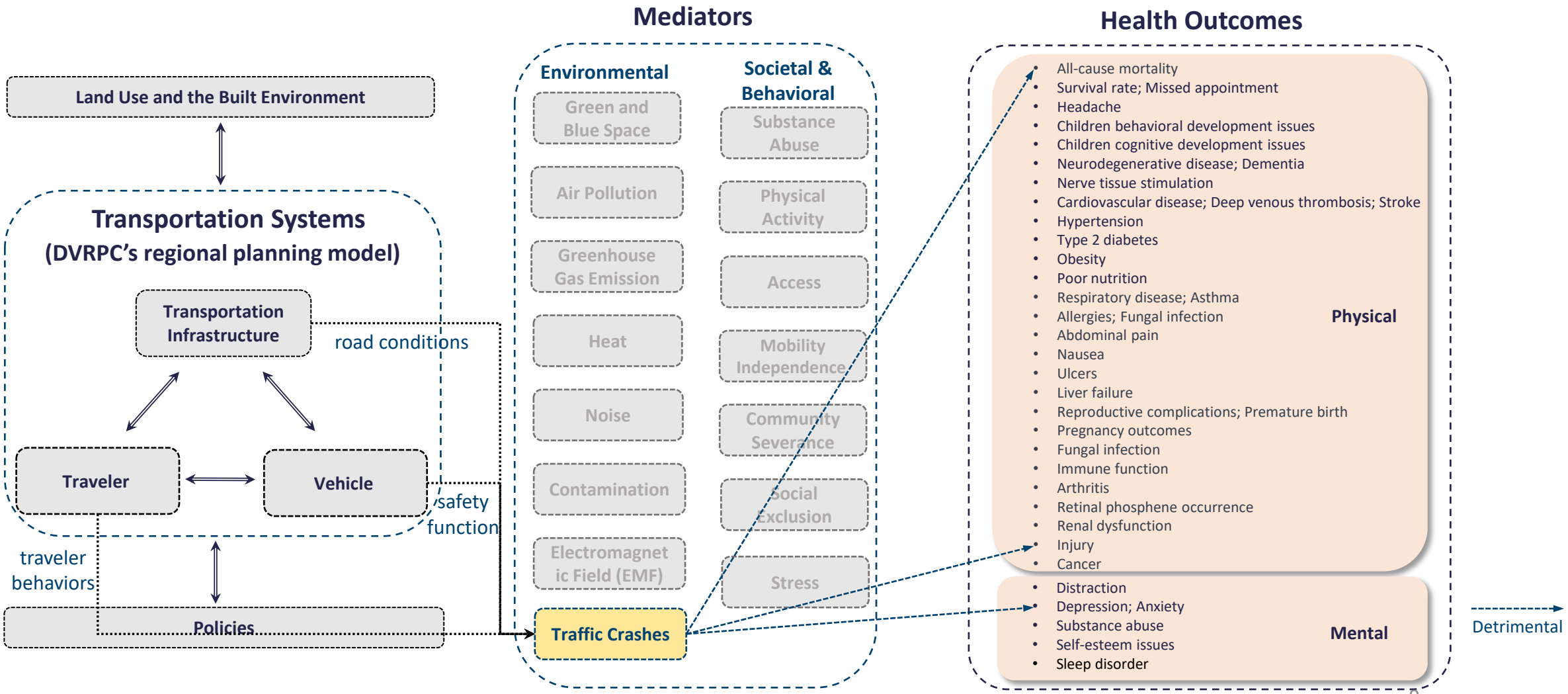
	Mediators	Green and Blue Spaces	Physical Activity	Access	Mobility Independence	Air Pollution	Greenhouse gas emissions	Noise	Heat	Contamination	Community Severance	Electromagnetic Fields (EMFs)	Stress	Traffic Crashes	Social Exclusion
Related Studies	Wahlgren and Schantz, 2014	■				■					■			■	
	Gascon et al. (2015)	■	■											■	
	de Vries et al., 2013	■	■										■		
	Dannenberg and Sener, 2015		■	■		■					■			■	
	Khreis et al., 2017	■	■	■		■		■	■		■		■		
	Nieuwenhuijsen, 2020	■		■		■		■	■				■		
	Woodcock et al., 2009						■								
	Graham et al., 2018				■										
	Mueller et al., 2017	■	■			■		■	■						
	Cohen et al., 2014		■	■		■			■		■		■		
	Halonen et al., 2015							■							
	Beelen et al., 2014					■									
	Mackett and Thoreau, 2015										■				■
	Turner et al., 2012								■						
	Forouzanfar et al., 2015		■												
	Michael J and Marianne, 2016	■	■			■	■							■	
	Lawrence D. et.al. 2019		■			■		■						■	
	Astell-Burt et al., 2014	■													
	Lovasi et al., 2013	■	■	■											
	Ding et al., 2016											■			
	Handy et al., 2014		■	■										■	
	Panter et al., 2016		■												
	Yuan et al., 2019							■							
	Kelly et al., 2016			■											
	Rantanen, 2013				■										
	Marzi et al., 2018				■										
	Burant et al., 2018									■					
	Gaffield et al., 2003								■	■					
	Khan and Strand, 2018									■					
	Schwarz et al., 2016									■					
	Pablo Madriaza et al., 2016														■
	Turdalieva and Edling, 2018														■
	Mindell et al., 2017			■	■						■				■
	Methorst et al., 2017													■	
	Mindell et al. 2012													■	
	Elvik and Bjørnskau, 2017													■	
	Kockelman et al., 2016													■	
	Gao et al., 2015											■		■	
	Bi et al., 2016											■			
	Legrain et al., 2015												■		
	Litman, 2019														
	Walson and Berkley, 2018														
	Scheil-Adlung, 2015														

Results: Overview of Pathways



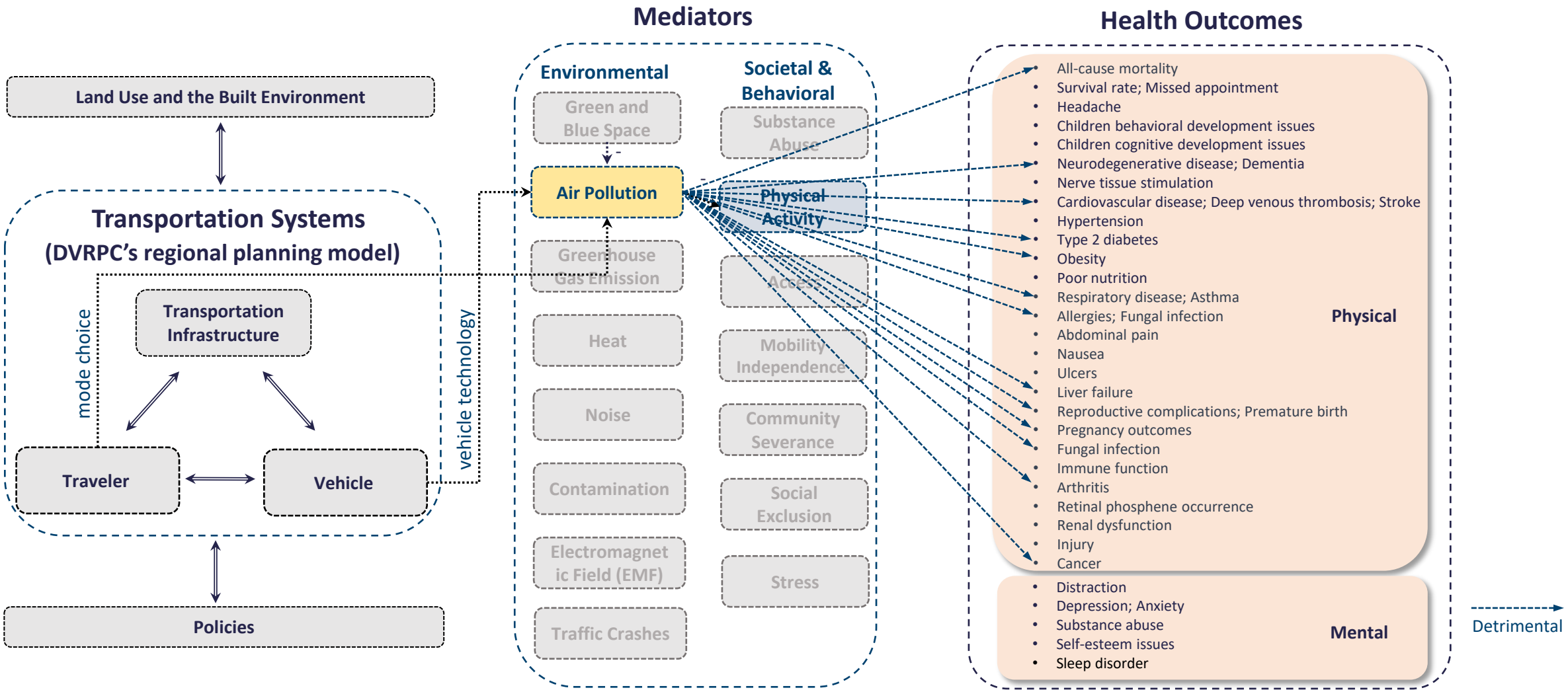
Traffic Crashes

Definition: *a collision involving one or more vehicles on a public road.*



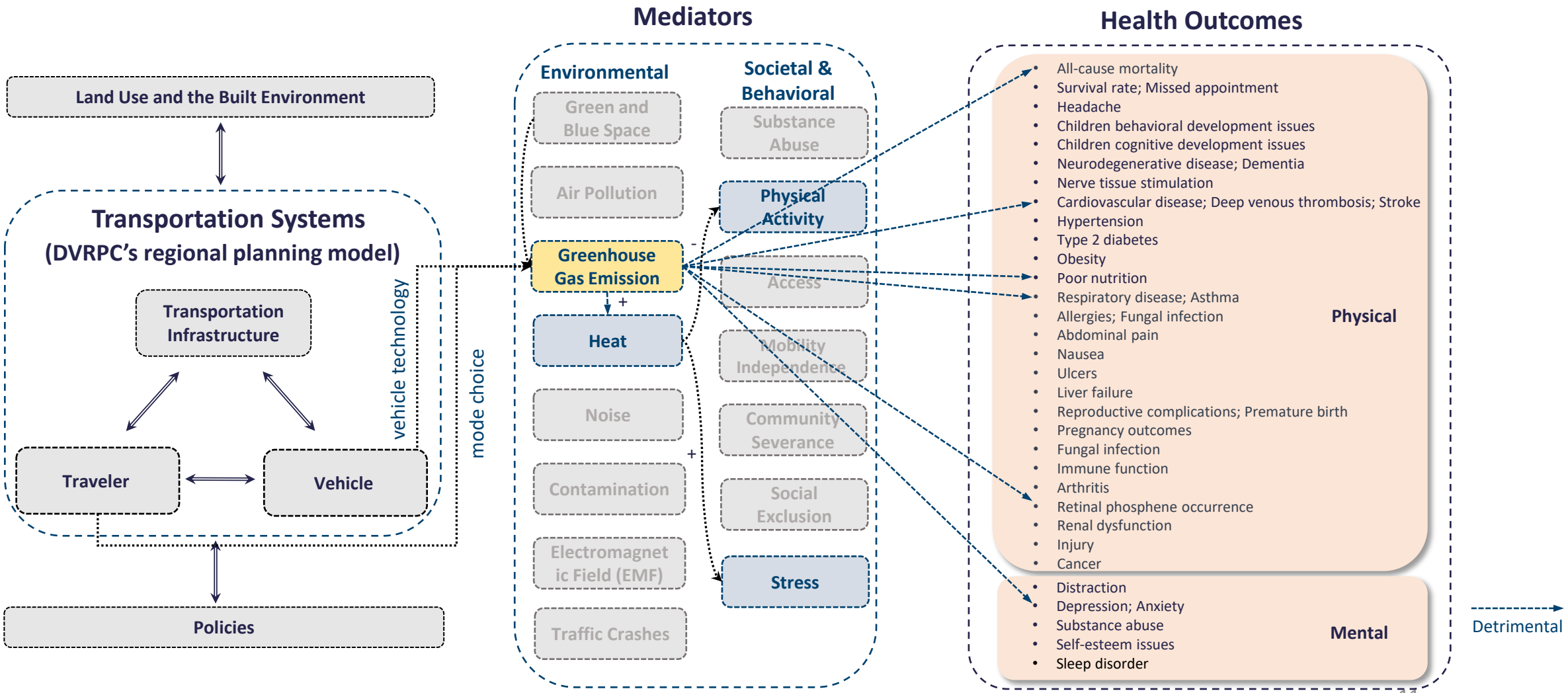
Air Pollution

Definition: *Emission from gasoline-powered motorized vehicles and dispersion of toxic substances in the air.*



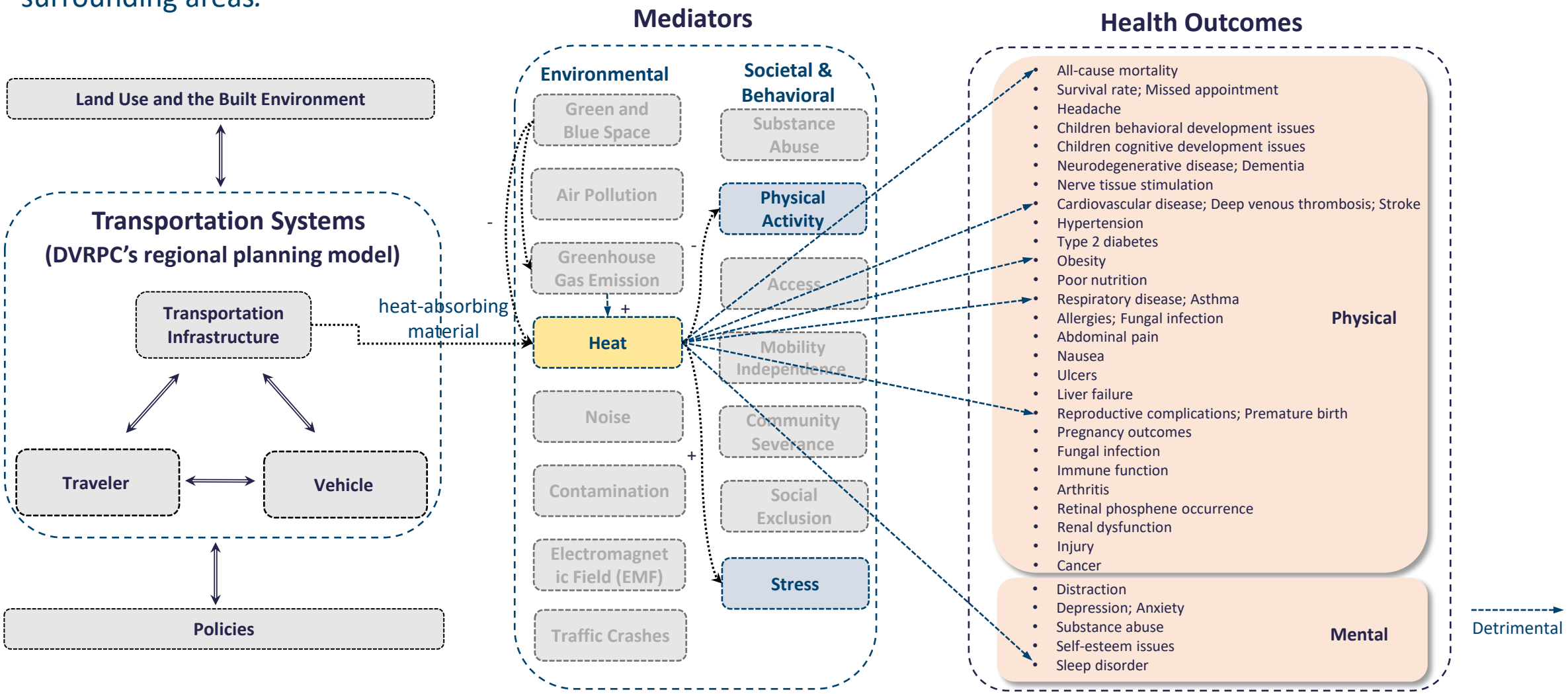
Greenhouse Gas (GHG) Emissions

Definition: *GHG includes CO2, methane, nitrous oxide, and fluorinated gases which trap heat in the atmosphere.*



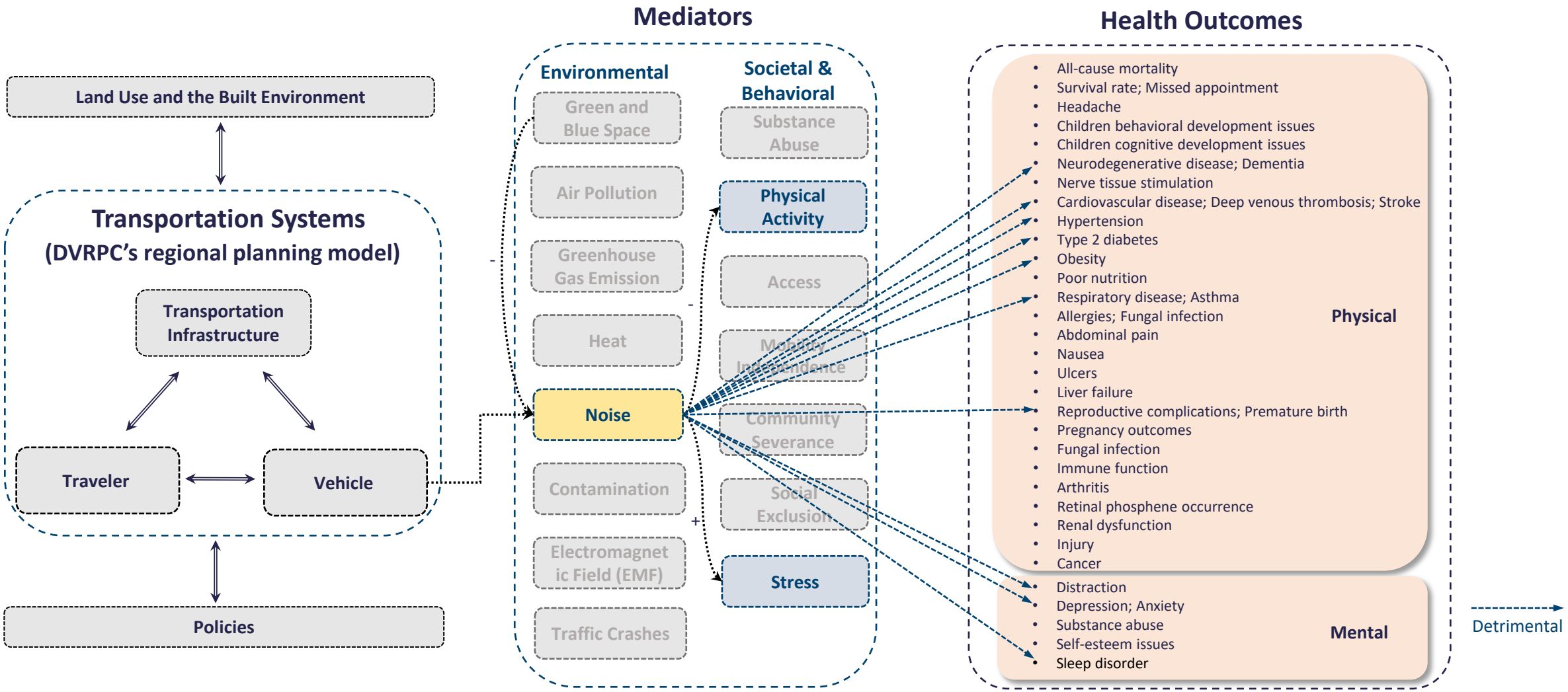
Heat

Definition: Urban heat islands (UHIs) are urban spaces with greater surface and air temperatures compared with surrounding areas.



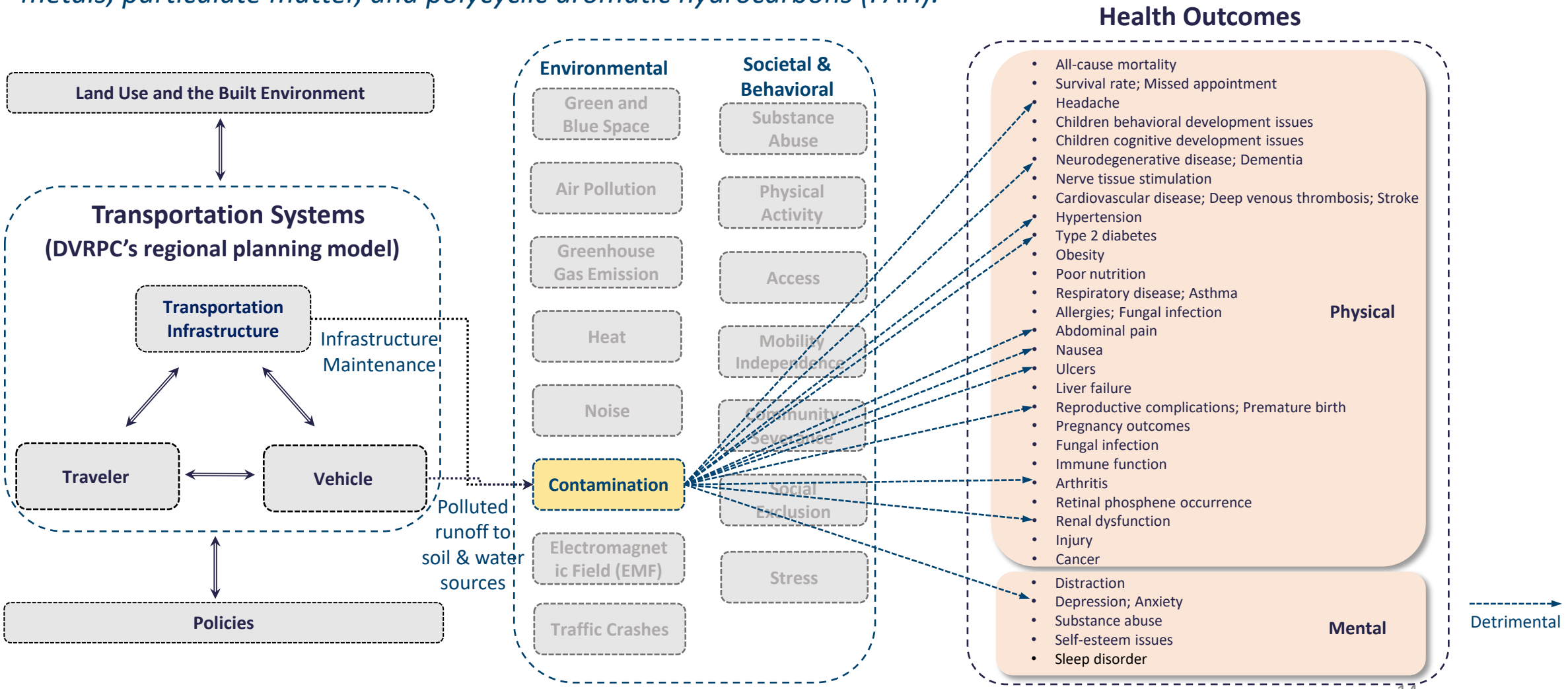
Noise

Definition: *Sounds from motorized vehicles, trains, and planes at levels that are detrimental to health.*



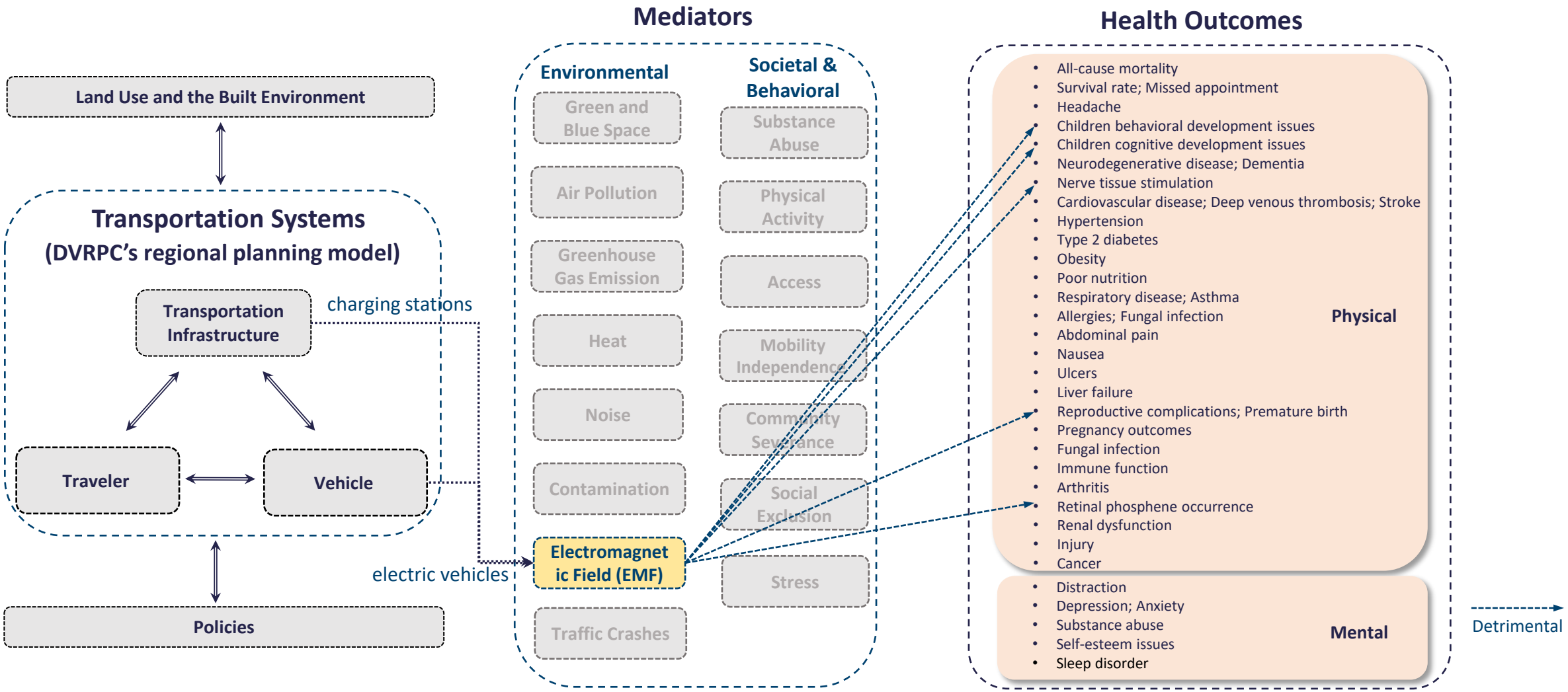
Contamination

Definition: *Harmful chemicals and pollutants from road traffic, brake, and tire wear such as oils, gasoline, heavy metals, particulate matter, and polycyclic aromatic hydrocarbons (PAH).*



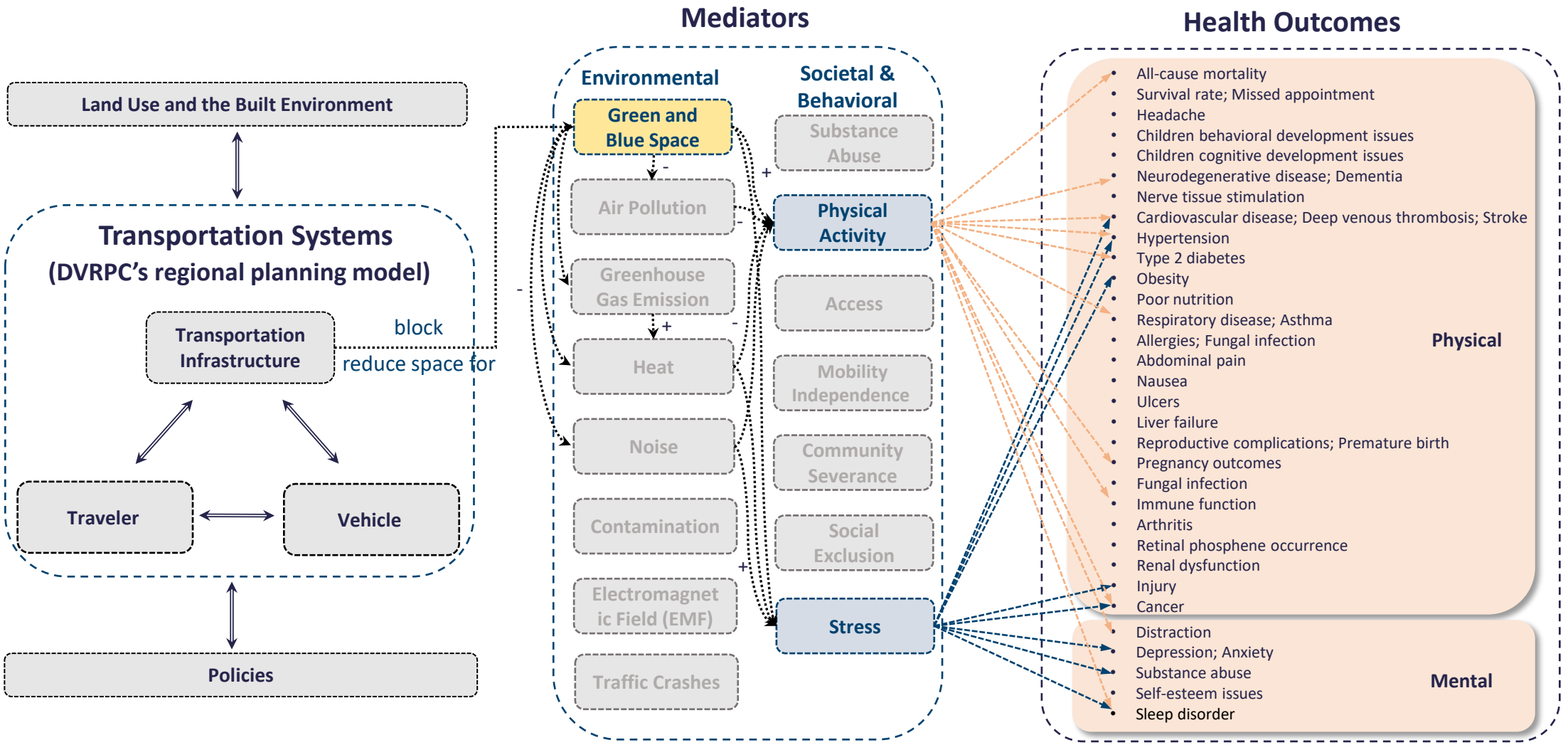
Electromagnetic Fields (EMF)

Definition: *Radiation associated with the use of electrical power.*



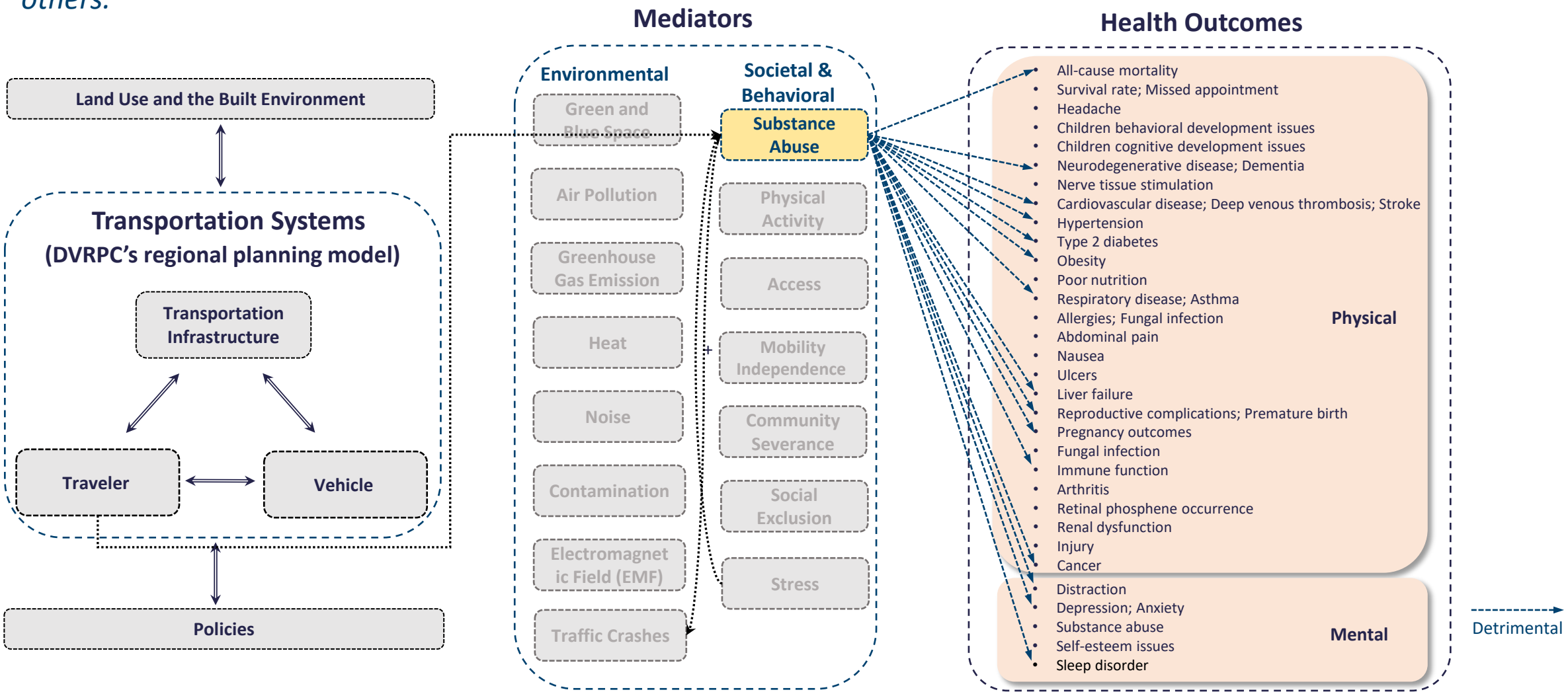
Green and Blue Space

Definition: *Public space covered by vegetation (green) or water (blue).*



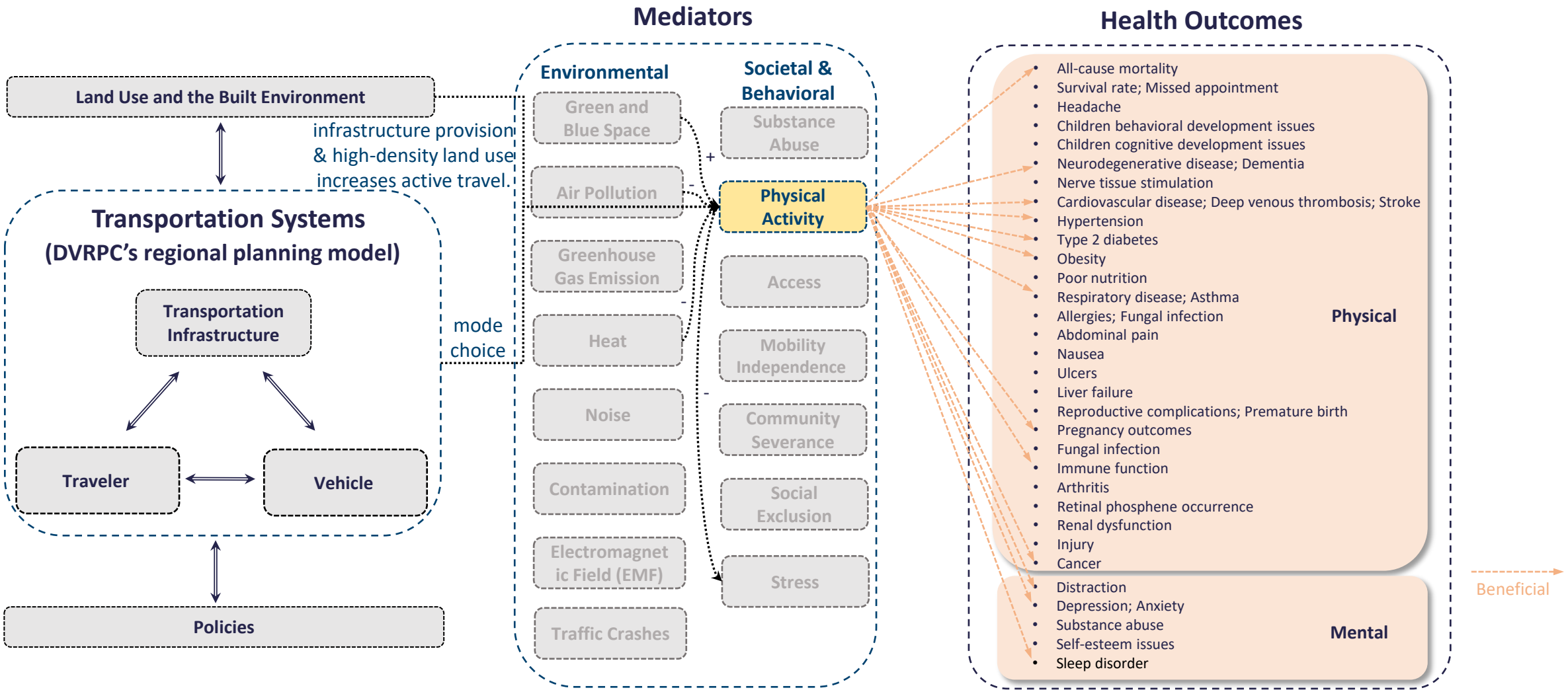
Substance Abuse

Definition: *consistent misuse of drugs, alcohol, or other substances in a way that is harmful to the individual or others.*



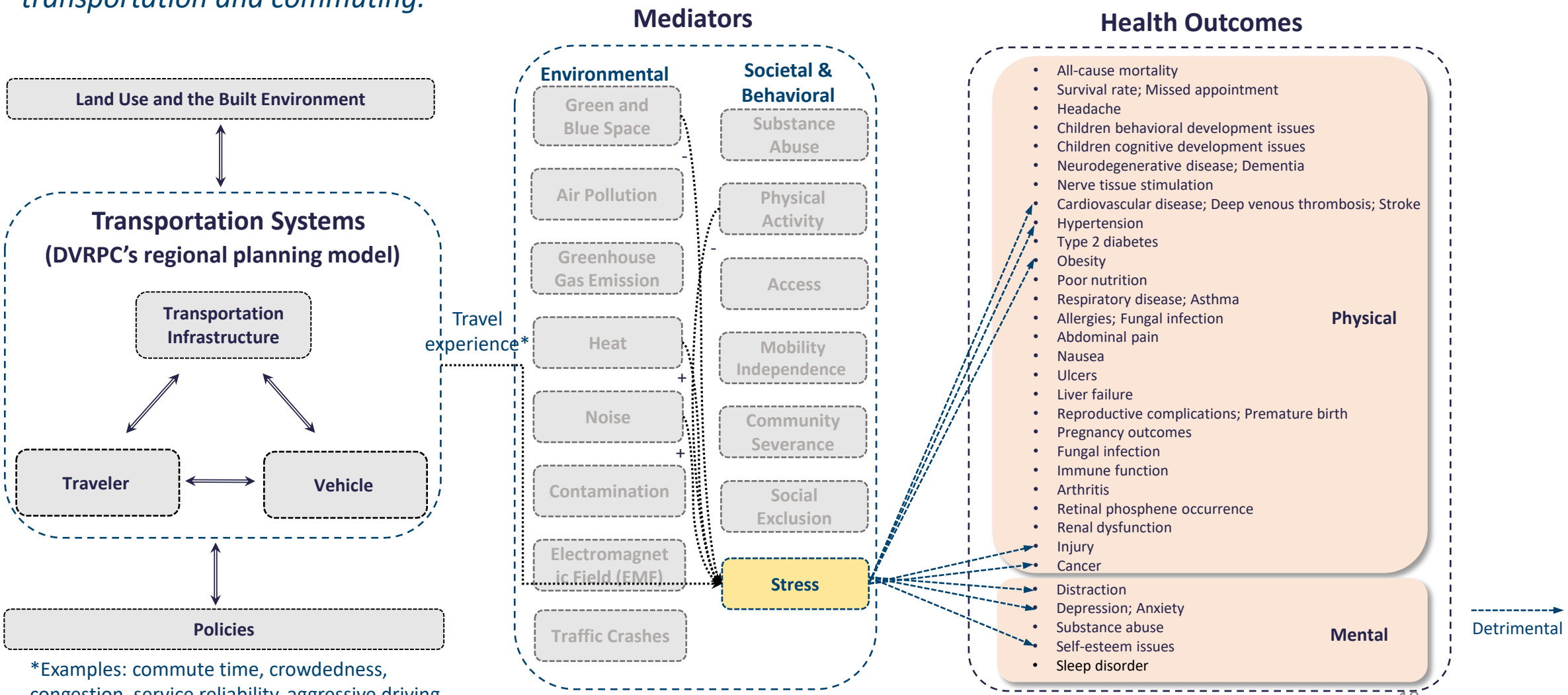
Physical Activity

Definition: *Body movement requiring energy expenditure.*



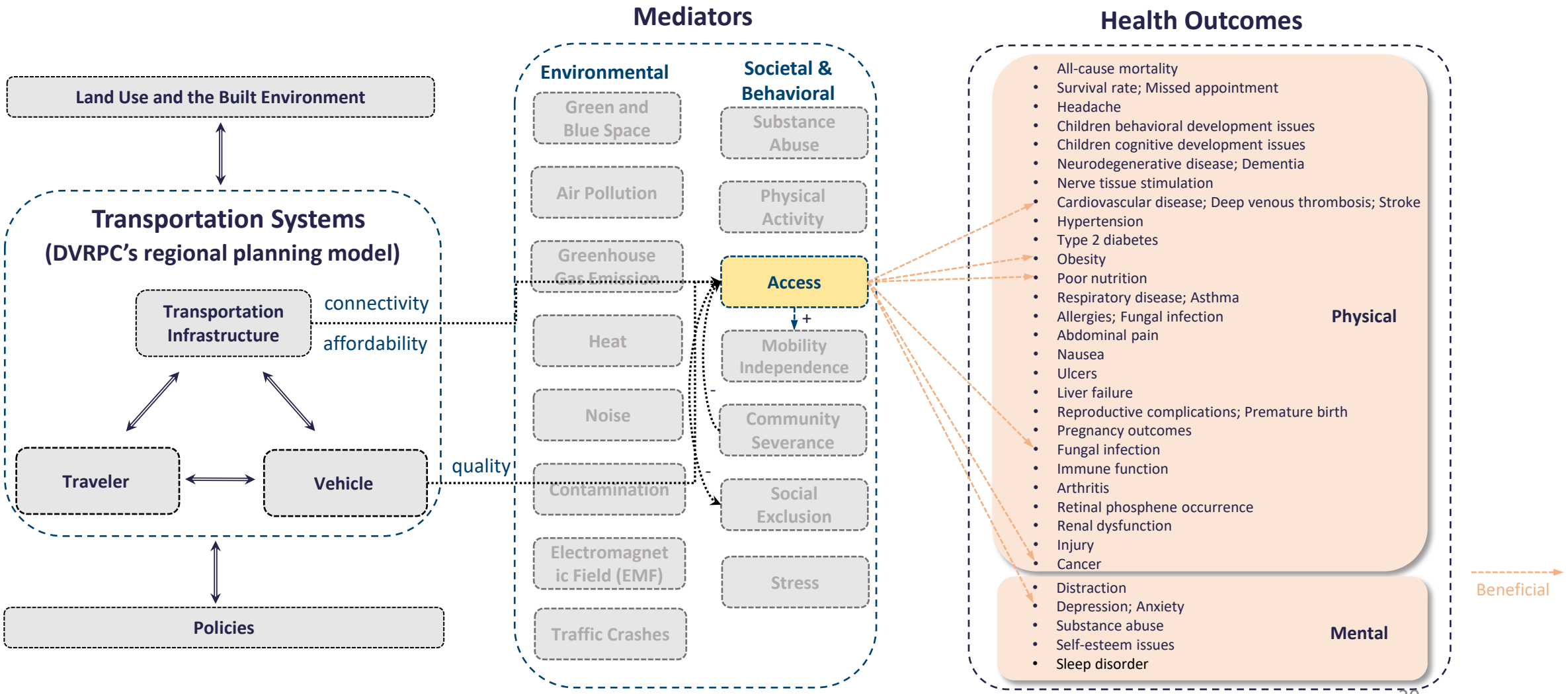
Stress

Definition: *Psychological strain and tension that individuals can experience as a result of factors related to transportation and commuting.*



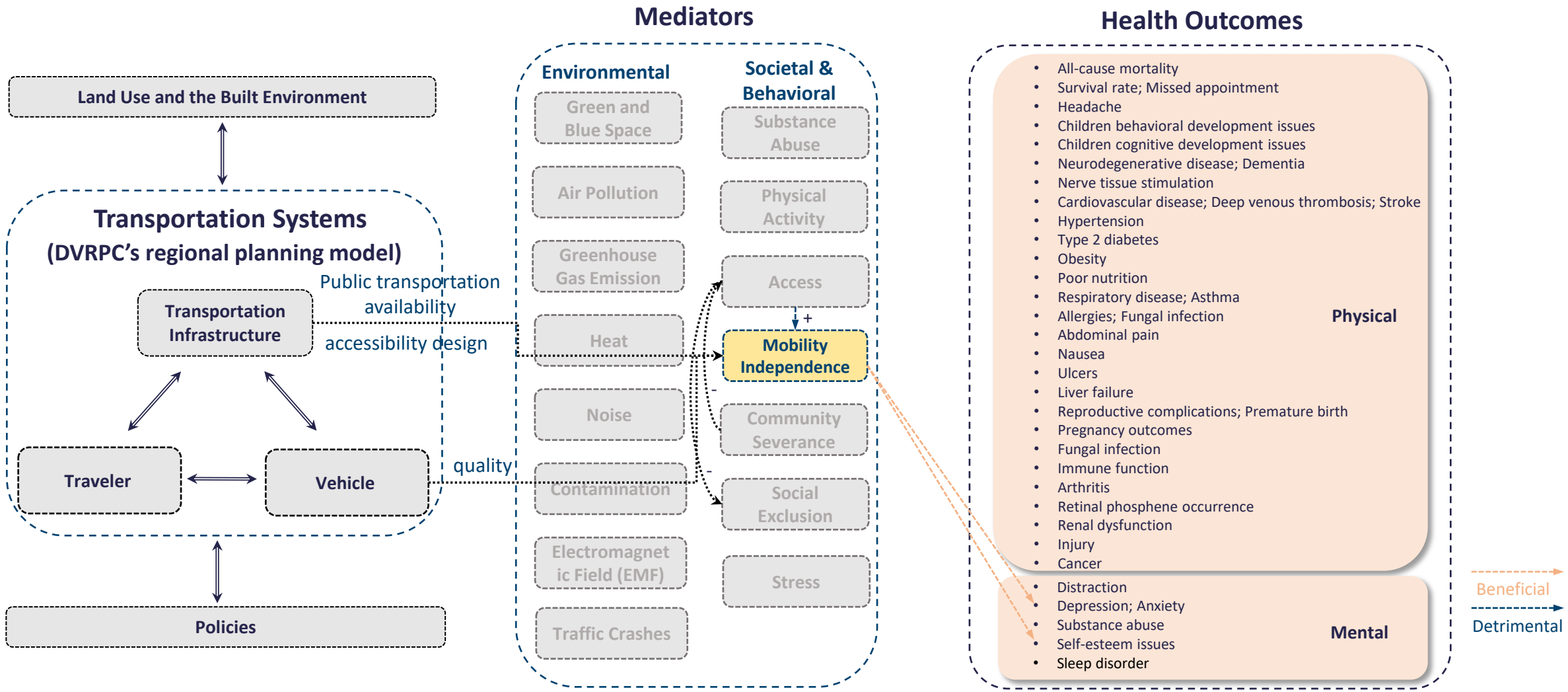
Access

Definition: *Ability to reach opportunities, goods and services.*



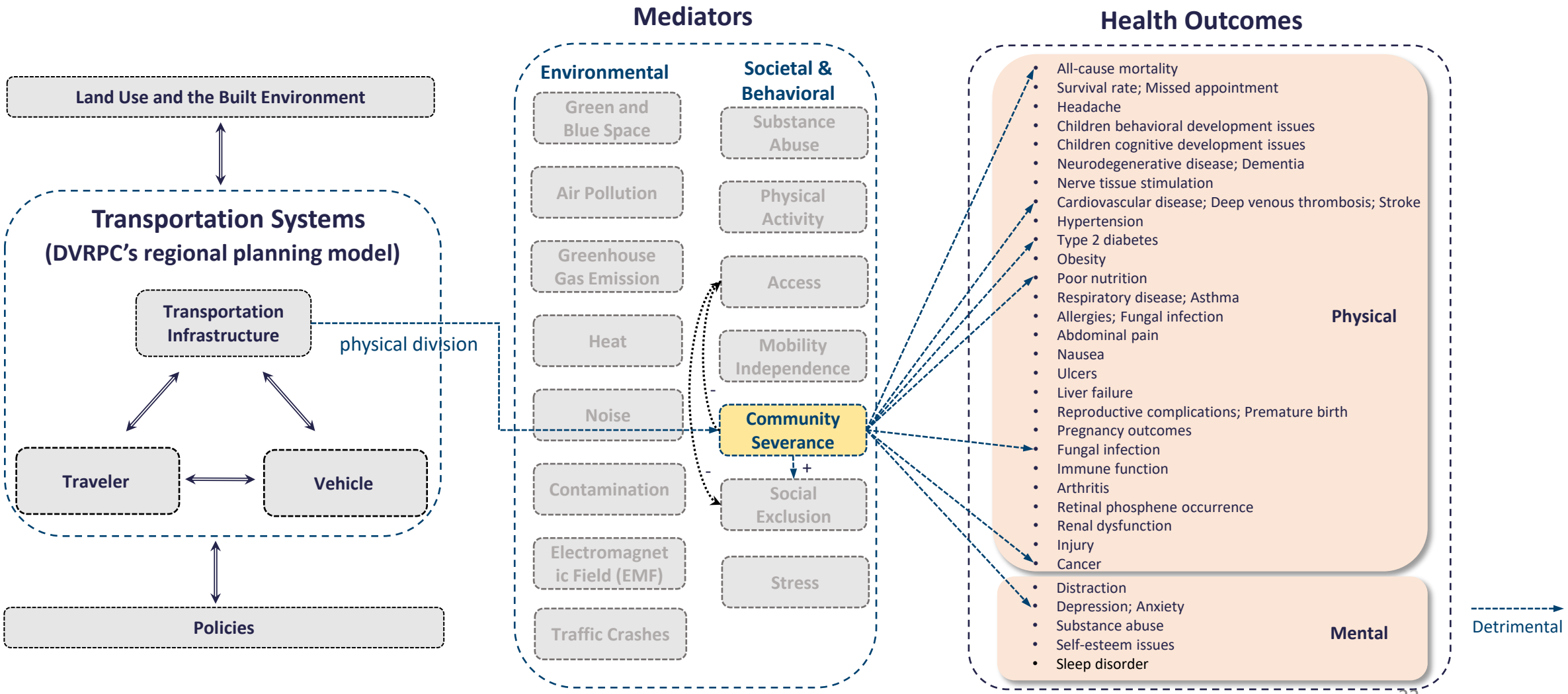
Mobility Independence

Definition: *Ability to use various transportation modes to access opportunities, goods and services without assistance or supervision.*



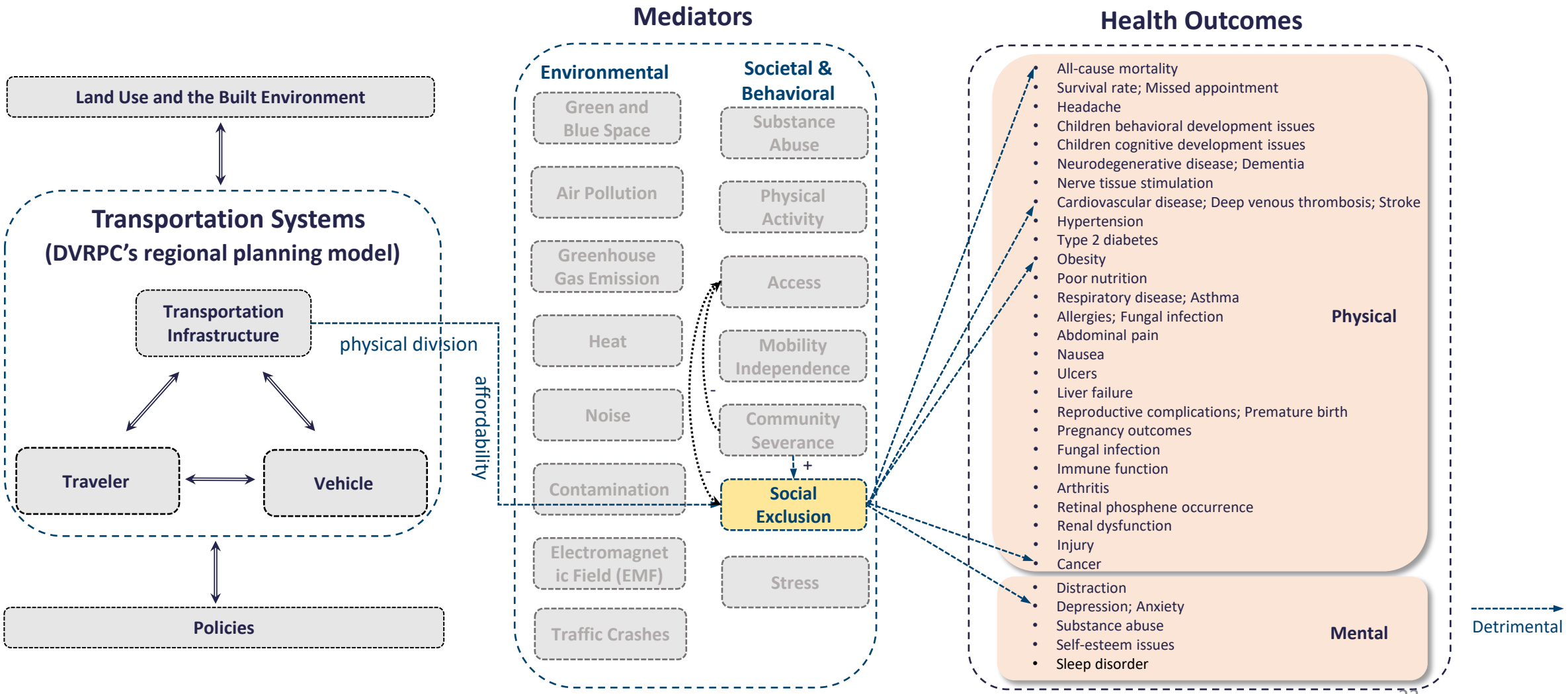
Community Severance

Definition: *Space and people separation caused by transportation infrastructure.*



Social Exclusion

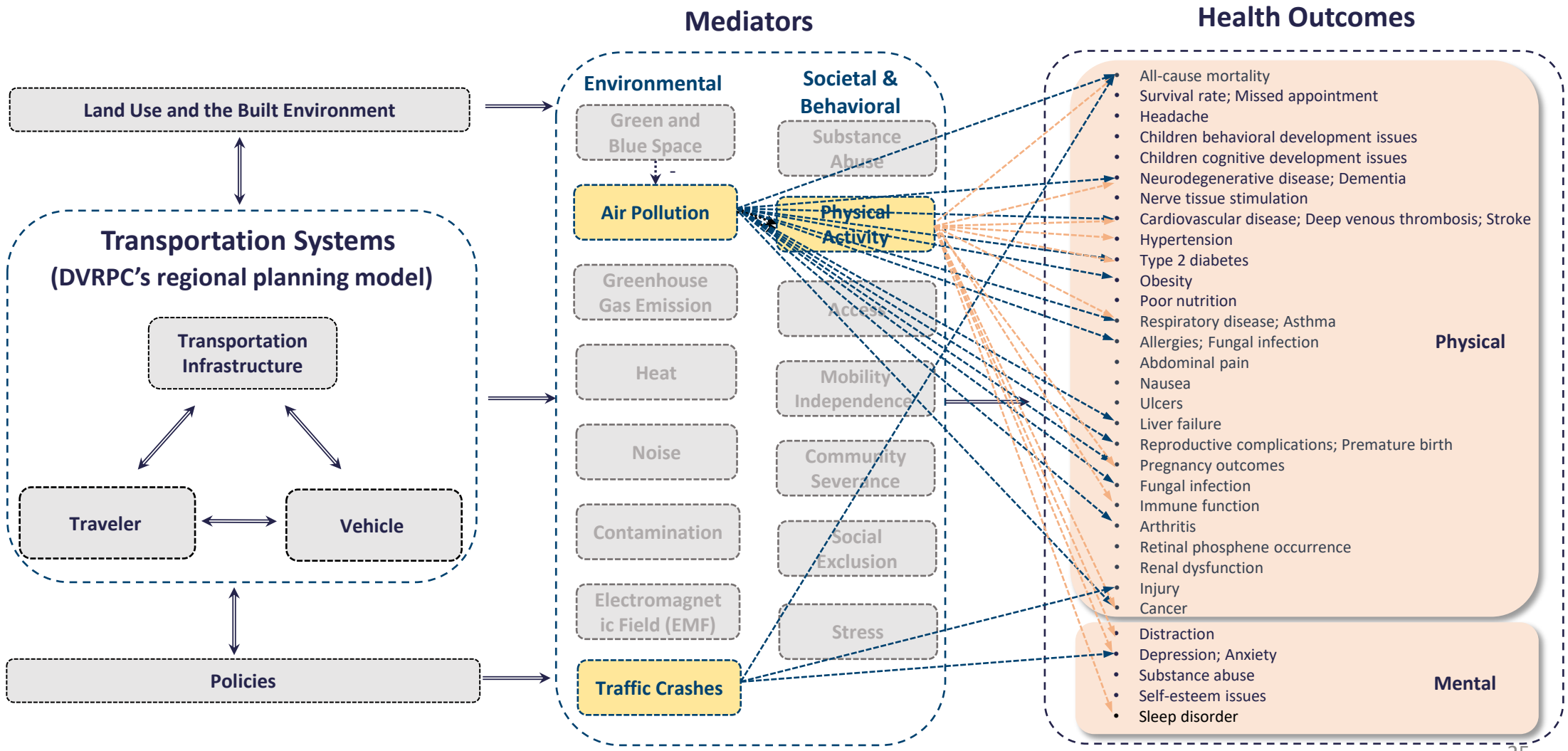
Definition: *Culmination of transportation-related inhibitions that limit the opportunity to participate in community activities and be socially engaged.*



Integrated Transport and Health Impact Model (ITHIM)

- **What is ITHIM**
  - A range of models and tools that quantifies **the health effects of transport scenarios**.
  - It has been applied in various contexts globally, including cities in the UK, US, Italy, Malaysia, India, etc.
  - It typically assesses the health outcomes through three key mediators: **physical activity, air pollution, and traffic crashes.**

Key Pathways in ITHIM



25

Next Steps

Pathways

Identify Health Impact of Transportation Activity through multiple pathways

1

2

Model

Explore Transport and Health Impact Models (e.g., ITHIM, HEAT)

Quantification

Health Impact Quantification Method

3

4

Roadmap

Develop a Roadmap to Health Impact Assessment for Transportation Systems

Thank you!



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