ERASMUS-EDU-2023-CBHE
Project number: 101129032

Duration: 36 months
(01/01/2024 – 31/12/2026)

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LAND MANAGEMENT
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MICRO-CREDENTIAL

CLIMATE CHANGE FOR SUSTAINABLE LAND MANAGEMENT IN CENTRAL ASIA

7.- Cities, Air Quality and Human Health

Health Impacts: Heat Stress, Respiratory Disease and Vulnerable Groups

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From Urban Environmental Hazards to Human Health

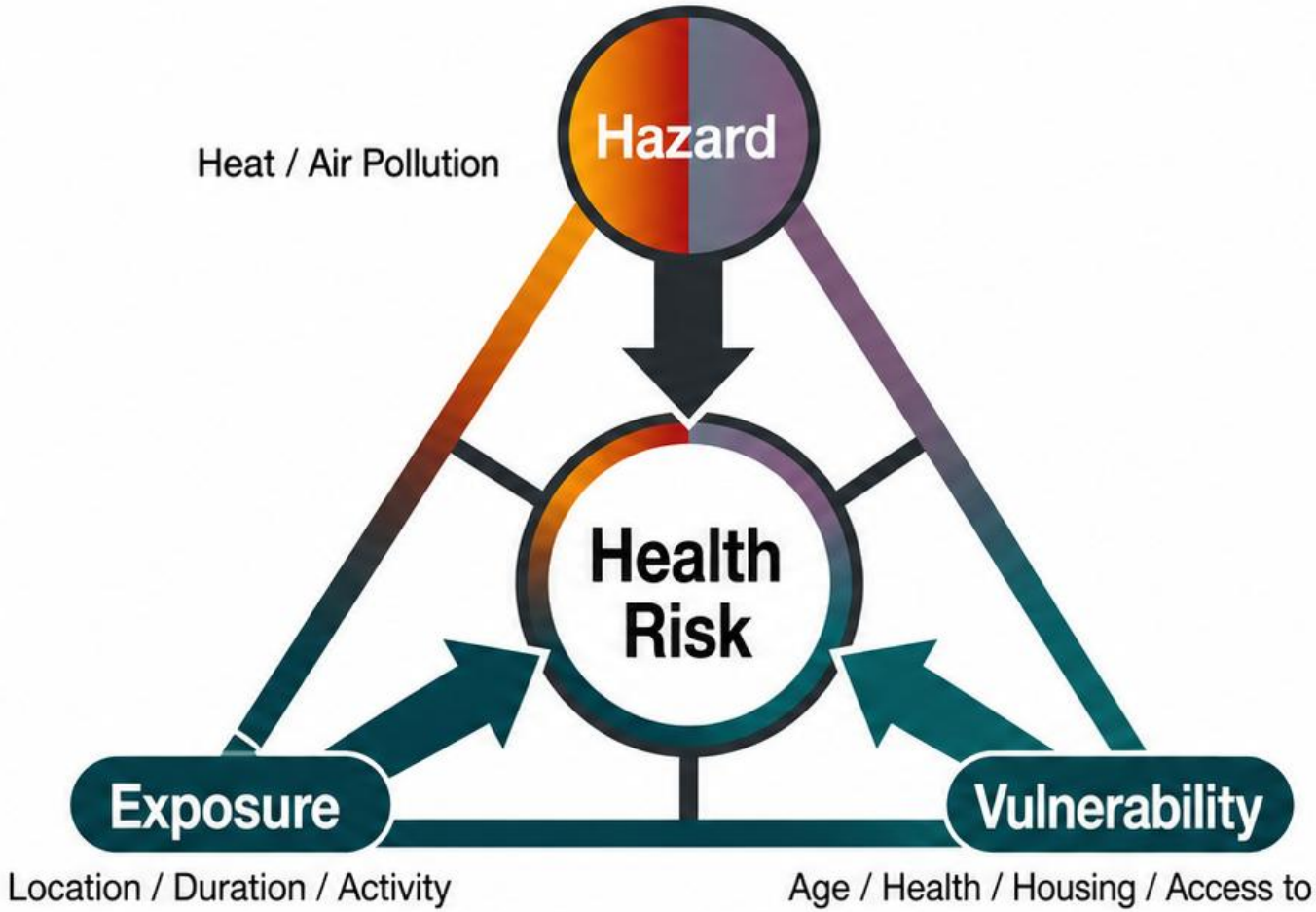


- Heat and polluted air become health risks through exposure.
- Health impacts depend on both hazard intensity and human vulnerability.
- Combined exposure creates unequal health burdens across urban populations.

Environmental health risk depends not only on the hazard, but also on who is exposed and how.

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Why the Same Hazard Does Not Affect Everyone Equally

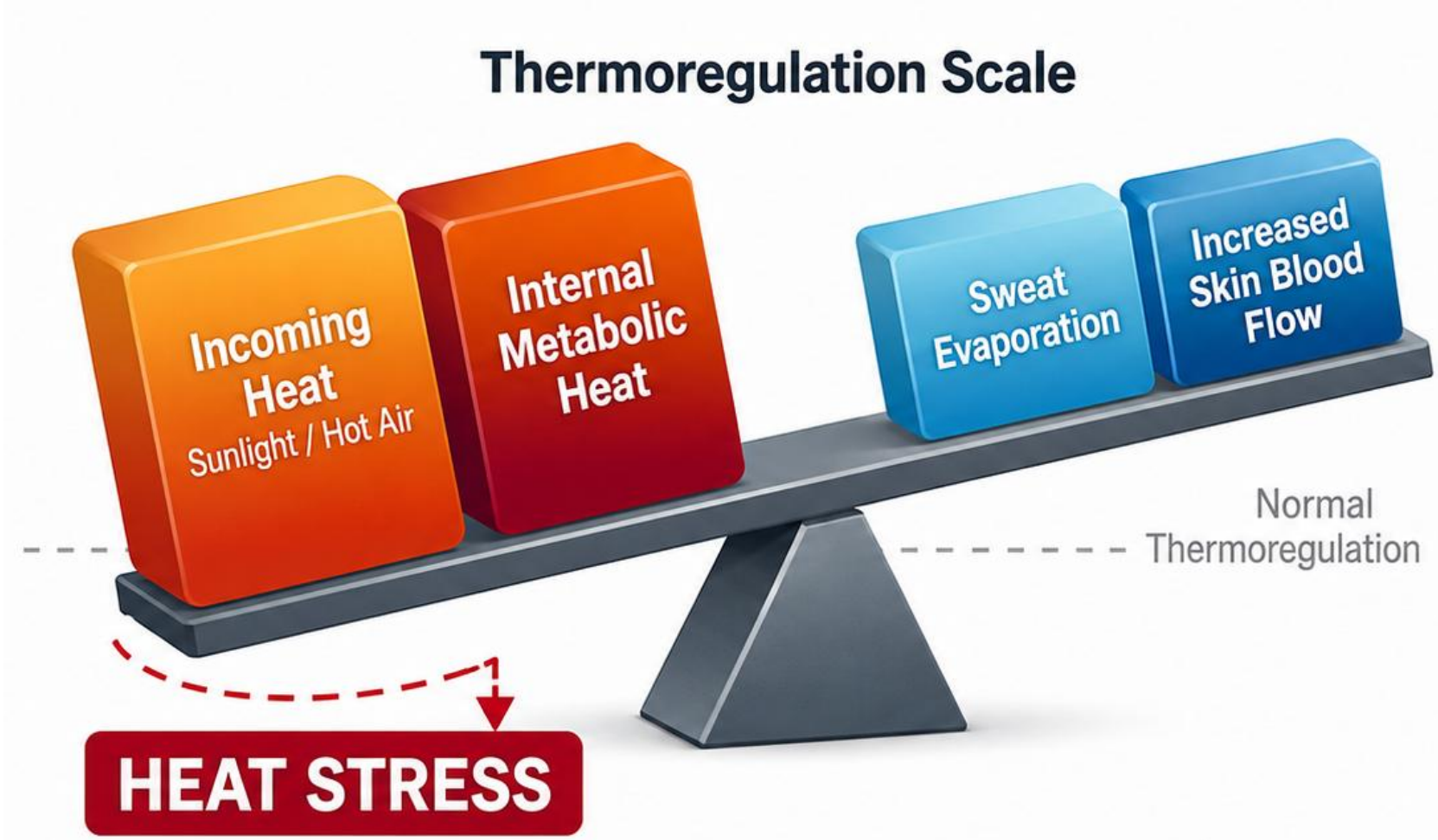


- **Hazard:** Intensity of heat or air pollution
- **Exposure:** Where, how long, and during which activities
- **Vulnerability:** Age, health, housing, and access to protection

Protecting health requires reducing hazards, exposure, and vulnerability.

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When Heat Becomes Heat Stress

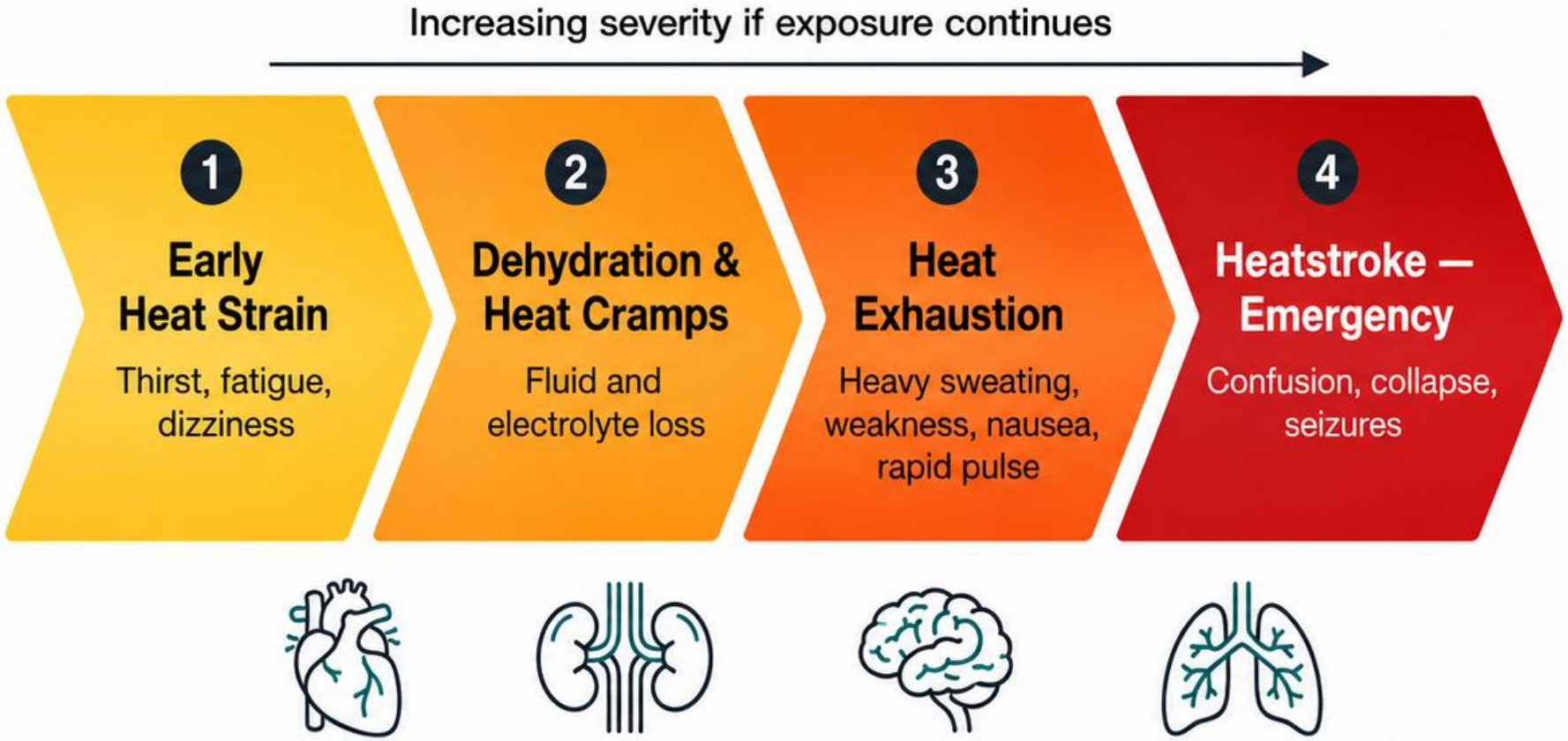


- Core temperature remains stable when heat gain equals heat loss.
- Sunlight and physical exertion increase the total heat load.
- Humidity, clothing and poor airflow reduce effective cooling.

Heat stress occurs when total heat gain exceeds the body's cooling capacity.

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From Heat Stress to Heat-Related Illness

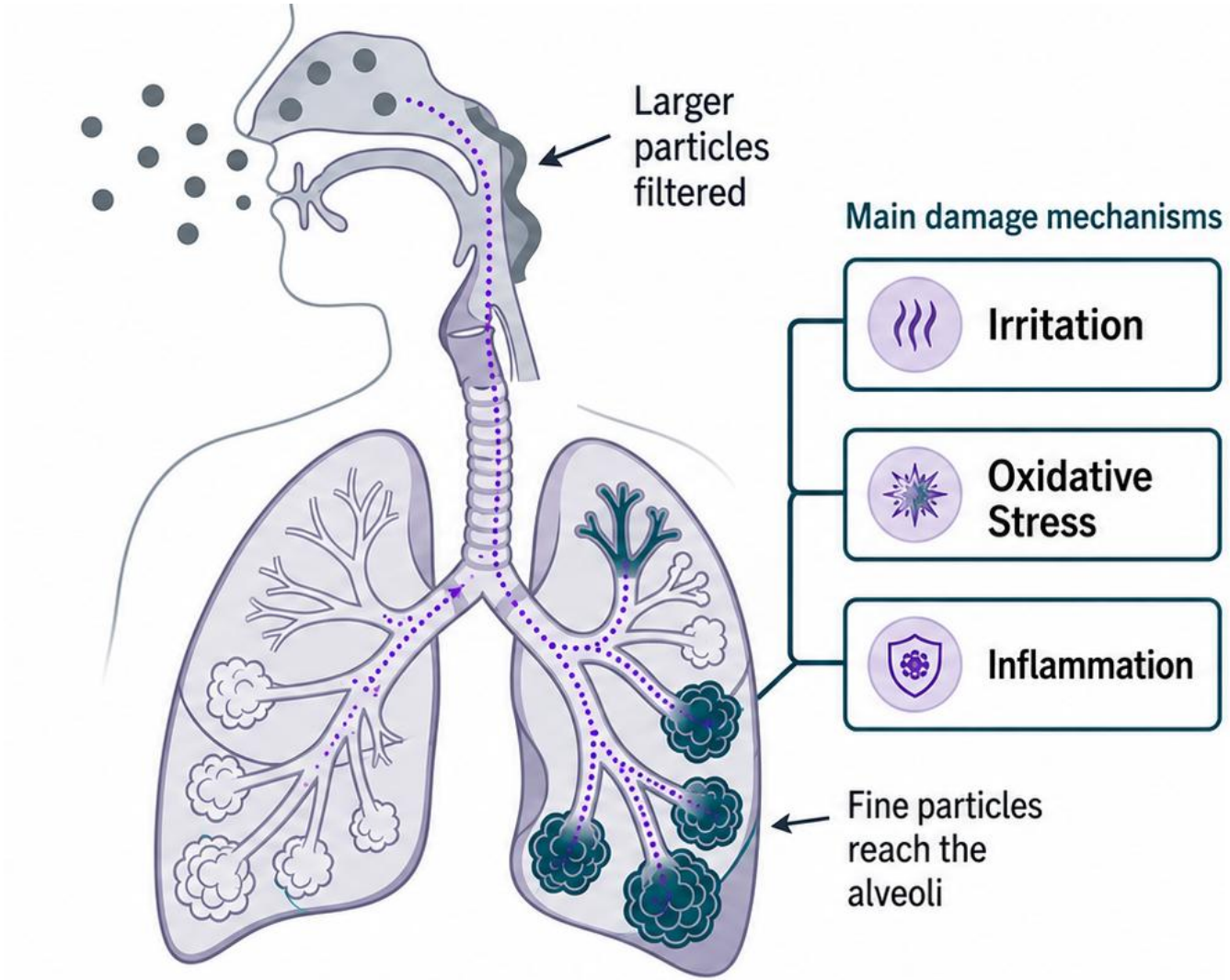


Heat can also worsen heart, kidney, brain, and respiratory conditions.

- Early symptoms should trigger cooling, rest, and hydration.
- Heat exhaustion reflects serious fluid and circulatory strain.
- Heatstroke requires immediate cooling and emergency care.

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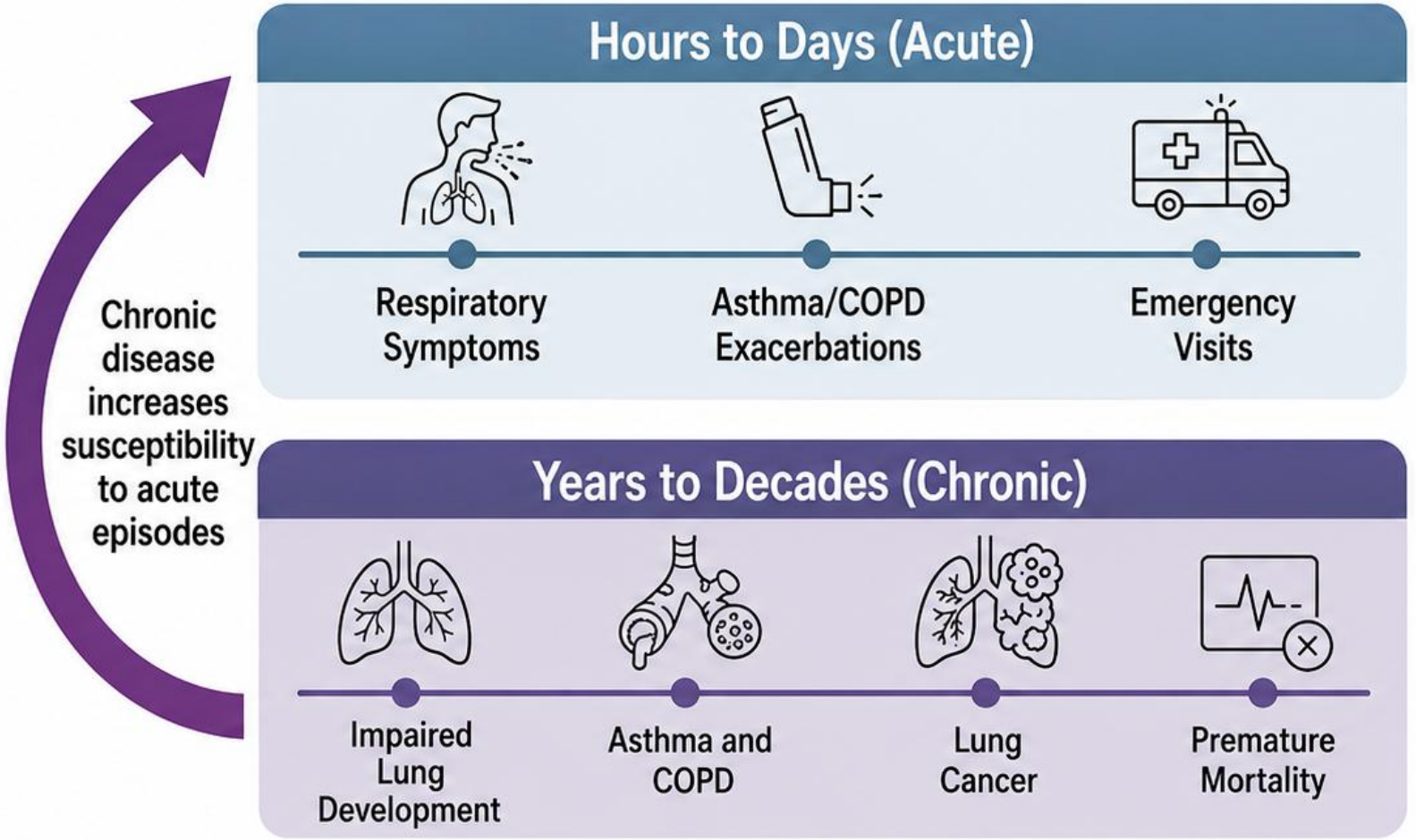
How Air Pollution Injures the Respiratory System



- Larger particles are often trapped in the upper airways.
- Fine particles can penetrate deep into the alveoli.
- Pollutants trigger irritation, oxidative stress, and inflammation.

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Acute Episodes and Chronic Respiratory Disease

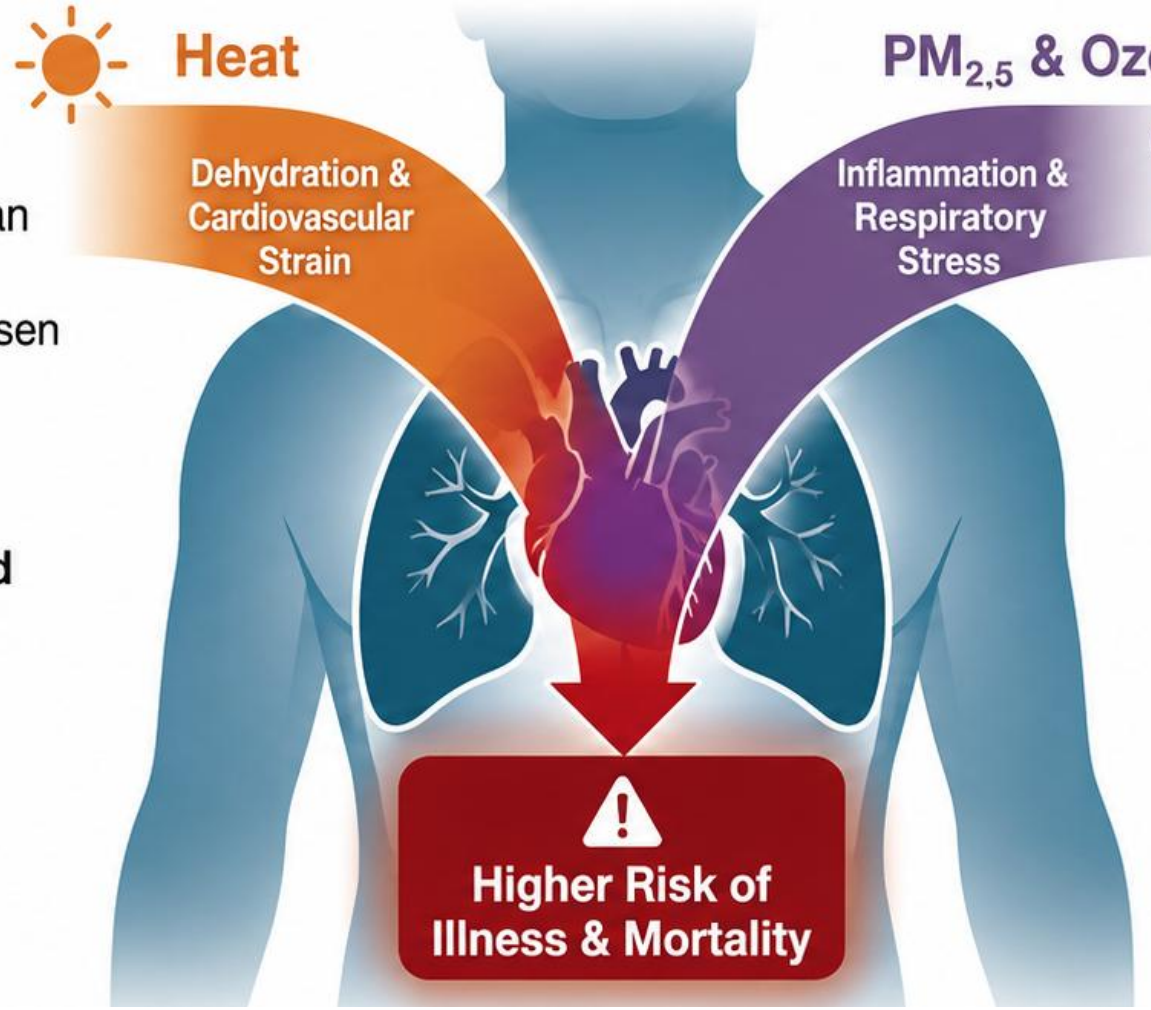


- Short-term exposure can trigger symptoms, exacerbations, and hospital visits.
- Long-term exposure contributes to chronic disease and reduced lung function.
- Chronic respiratory disease increases vulnerability during pollution episodes.

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When Heat and Air Pollution Act Together

- **Hot conditions** can increase ozone formation and worsen some pollution episodes.
- **Chronic heart and lung disease** can reduce the body's capacity to cope with heat.

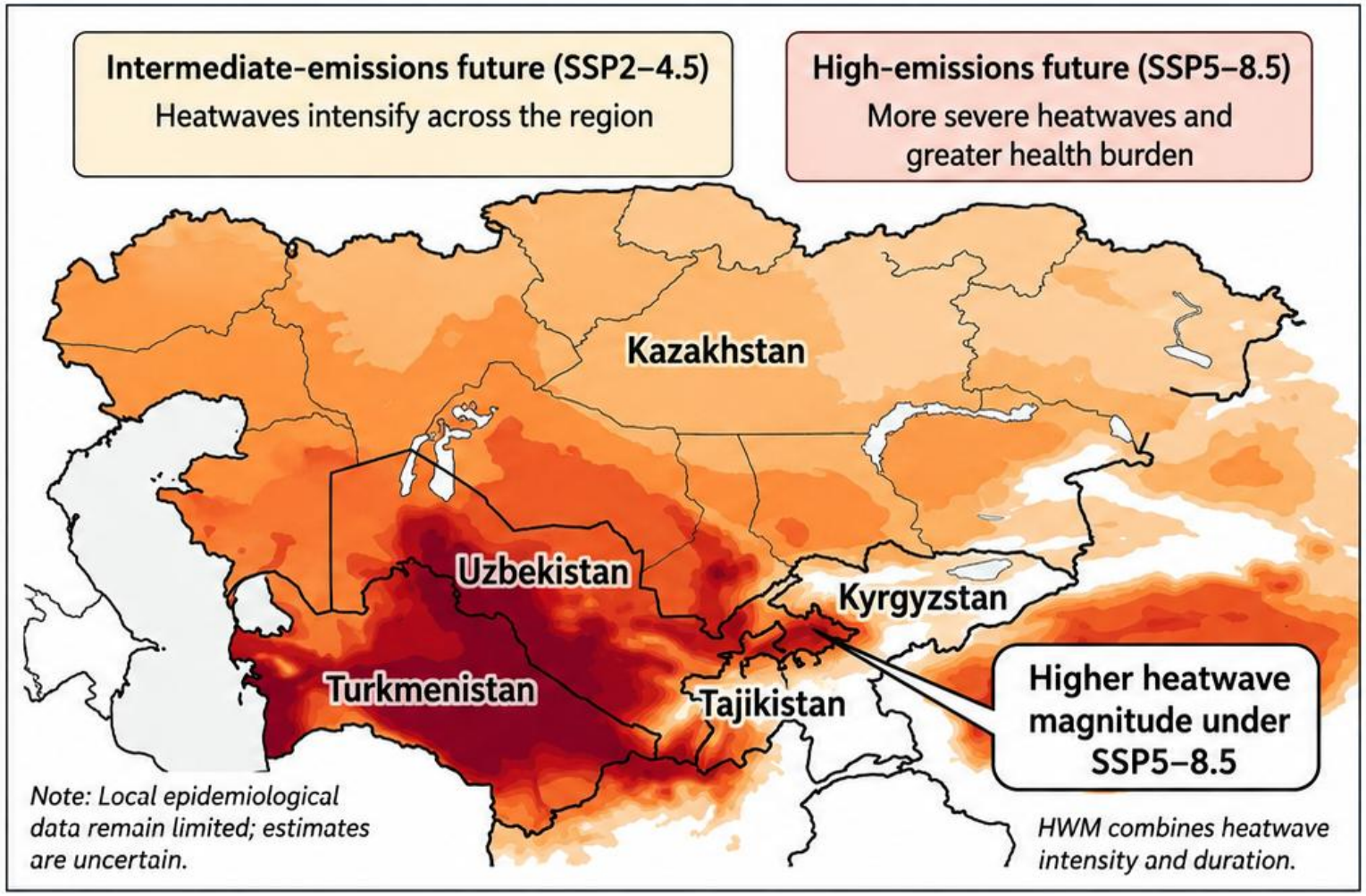


- **Combined exposure** increases cardiovascular and respiratory strain.
- People with existing disease may face greater risk.
- Heat and air-quality warnings should be coordinated.

Combined heat and air-pollution exposure can increase health risks beyond considering each hazard separately.

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Central Asia: A Growing Heat-Health Threat

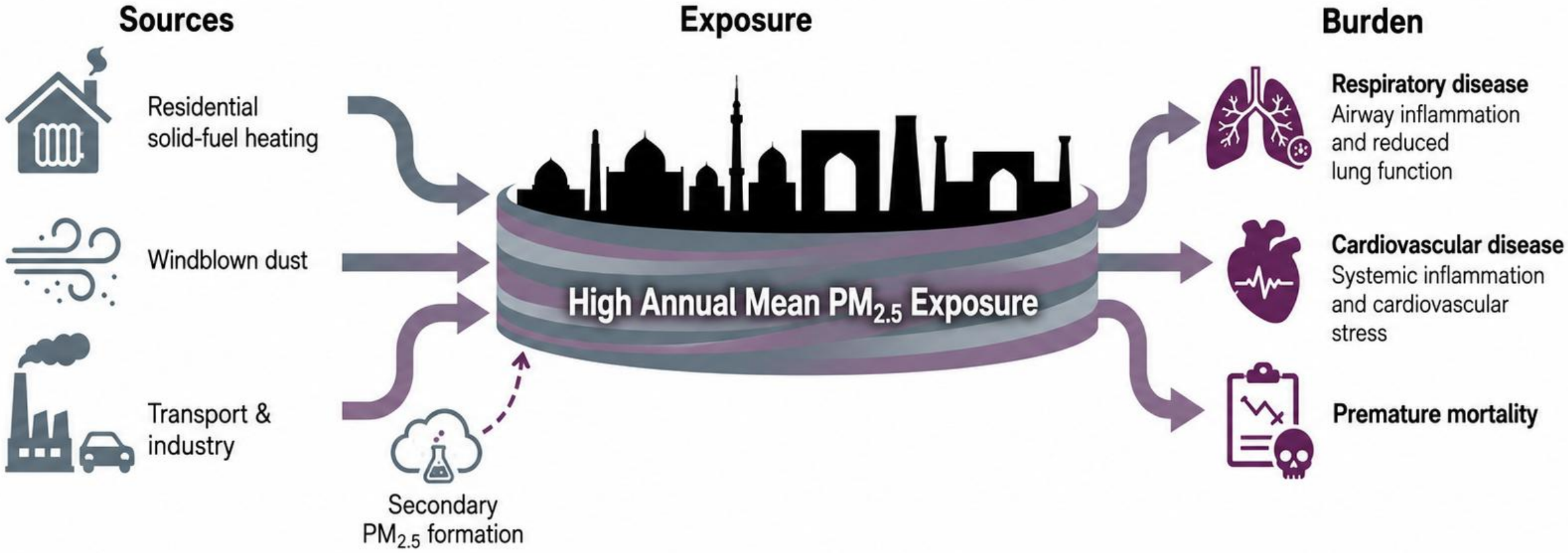


- Heatwaves are projected to intensify across Central Asia.
- Higher emissions produce more severe future heat extremes.
- Kazakhstan and Uzbekistan show large projected mortality increases.
- Regional mortality estimates remain uncertain because local health data are limited.

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Central Asian Cities: $PM_{2.5}$ Exposure and Respiratory Risk

- Annual $PM_{2.5}$ levels exceed WHO guidance in the studied cities.
- Exposure combines residential heating, dust, and transported pollution.
- Long-term exposure increases respiratory, cardiovascular, and mortality risks.

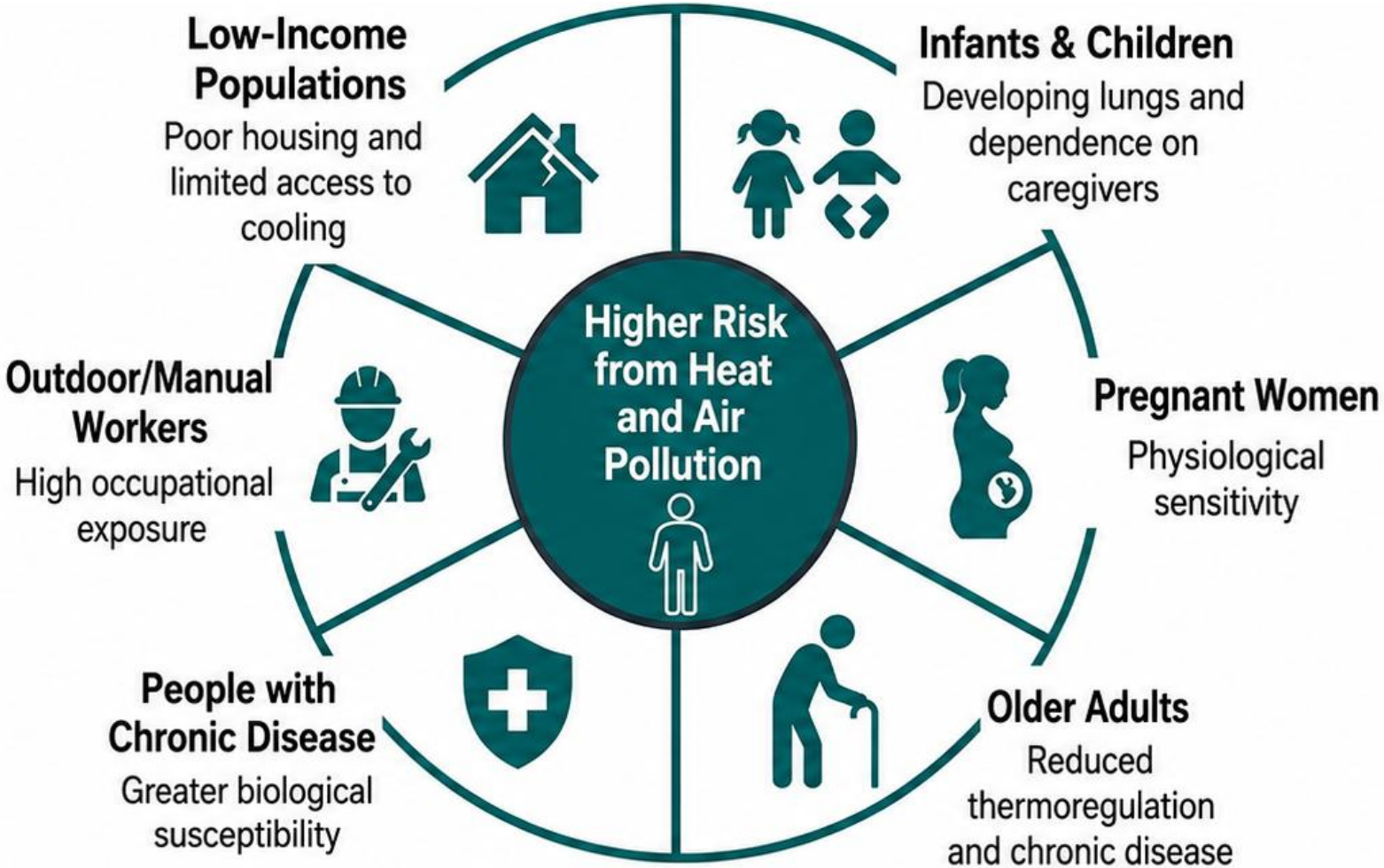


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Reducing long-term population exposure to PM2.5 is central to protecting health.

Who Is Most Vulnerable—and Why?

- Age and pregnancy can increase physiological sensitivity.
- Chronic disease reduces the capacity to cope with heat and pollution.
- Occupation, housing, income, and access to protection shape exposure.

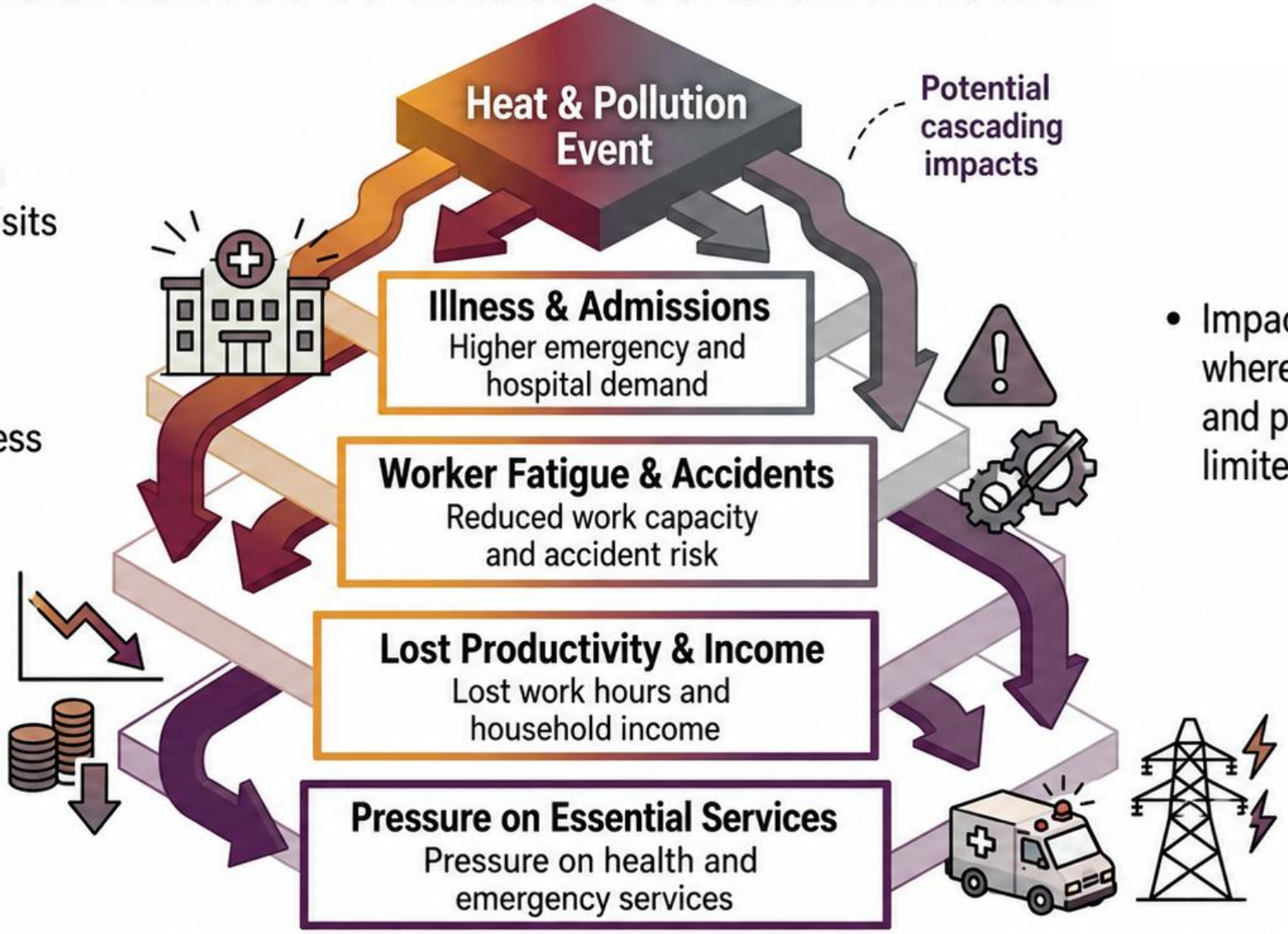


Vulnerability reflects both biological sensivity and unequal access to protection.

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From Individual Illness to Wider Social and Health-System Impacts

- Extreme episodes can increase emergency visits and hospital demand.
- Occupational heat stress reduces worker safety and productive hours.

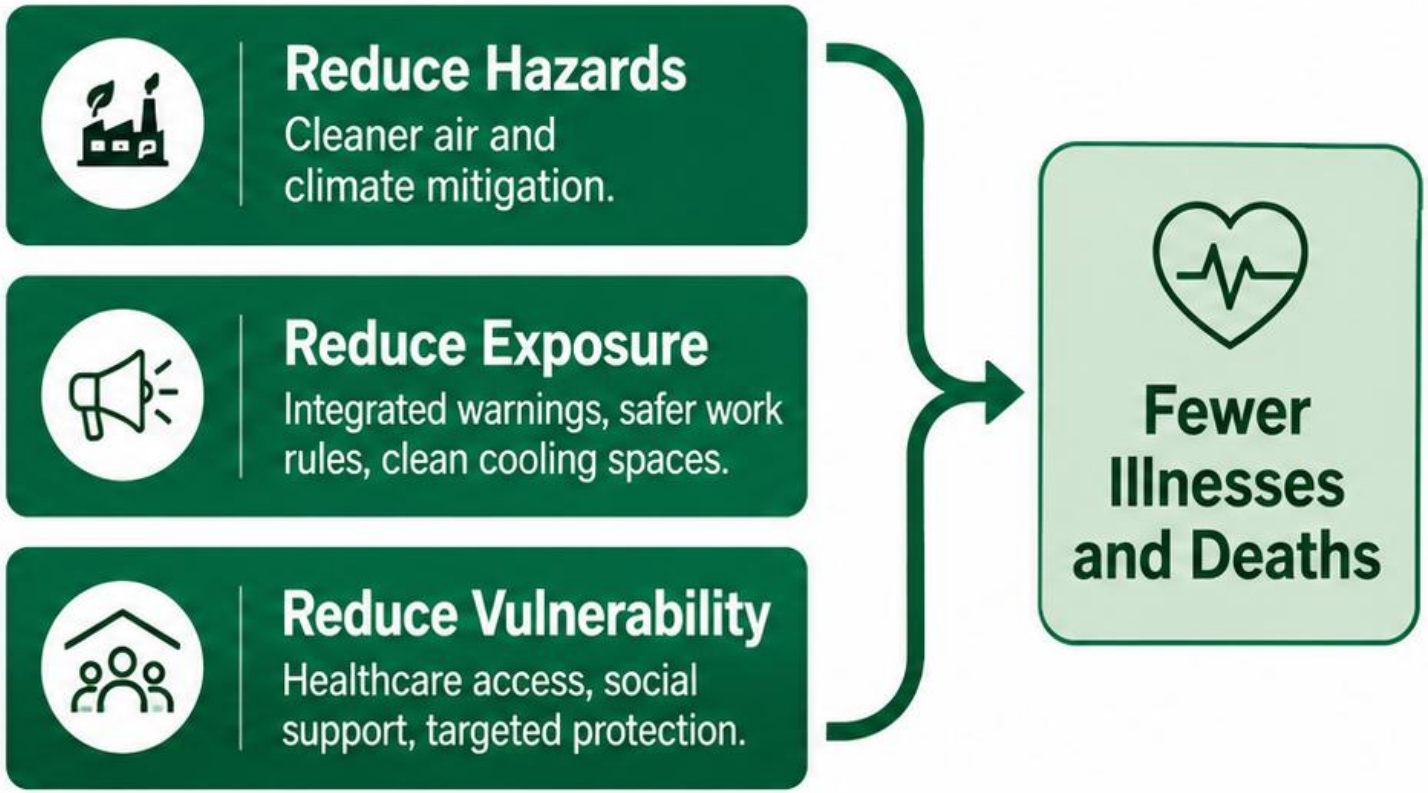


- Impacts are greatest where income, services, and protection are limited.

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Key Messages: Reduce Exposure, Strengthen Resilience, Protect People

- **Heat** and **air pollution** affect health through different but connected pathways.
- **Health risk** depends on environmental hazards, exposure, and vulnerability.
- **Central Asia** needs lower exposure and stronger protection for vulnerable groups.



Protecting health requires reducing hazards and exposure while strengthening resilience for vulnerable populations.

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