

# Project 6. Cumulative Risk Assessment Methods and Applications

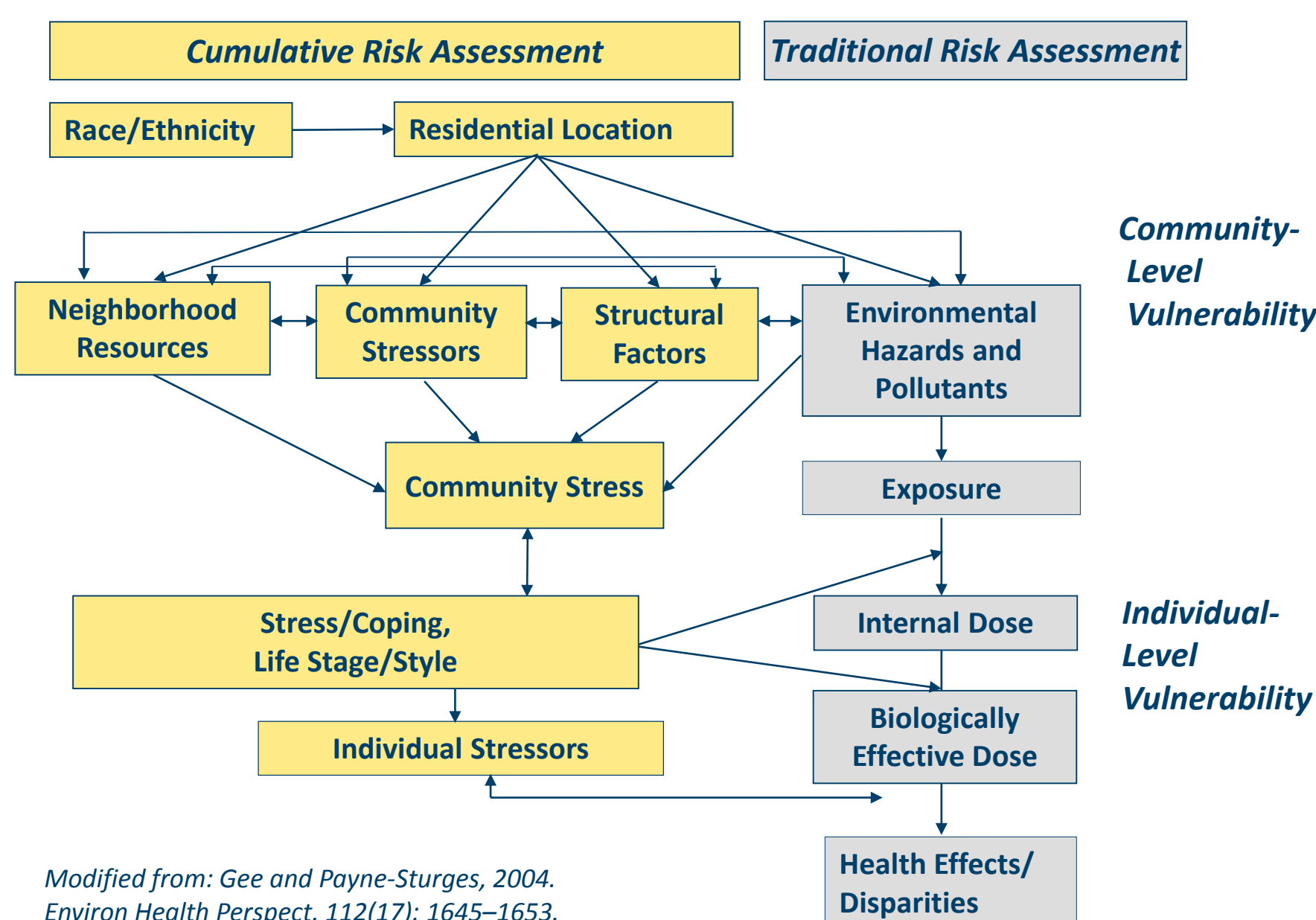
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## Risk Assessment Issue

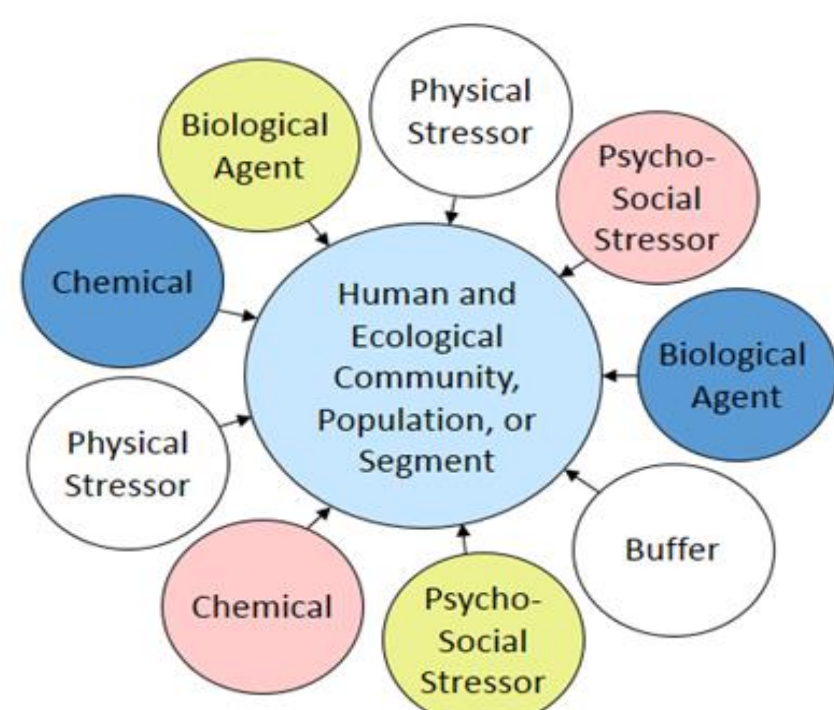
- Under Topic 3, Project 6 addresses the need to move beyond traditional risk assessment practices by developing cumulative risk assessment (CRA) methods to integrate and evaluate impacts of chemical and nonchemical stressors on the environment and human health (Fig. 1).
- Current CRA efforts include expanding the CRA framework to include human and ecological stressors and buffers (Fig. 2).
- This work on CRA will position the HHRA program to better address place-based assessment activities and thereby support sustainability, climate, and environmental justice efforts.

Figure 1. Traditional and Cumulative Human Health Risk Assessment Elements



Modified from: Gee and Payne-Sturges, 2004. Environ Health Perspect. 112(17): 1645-1653.

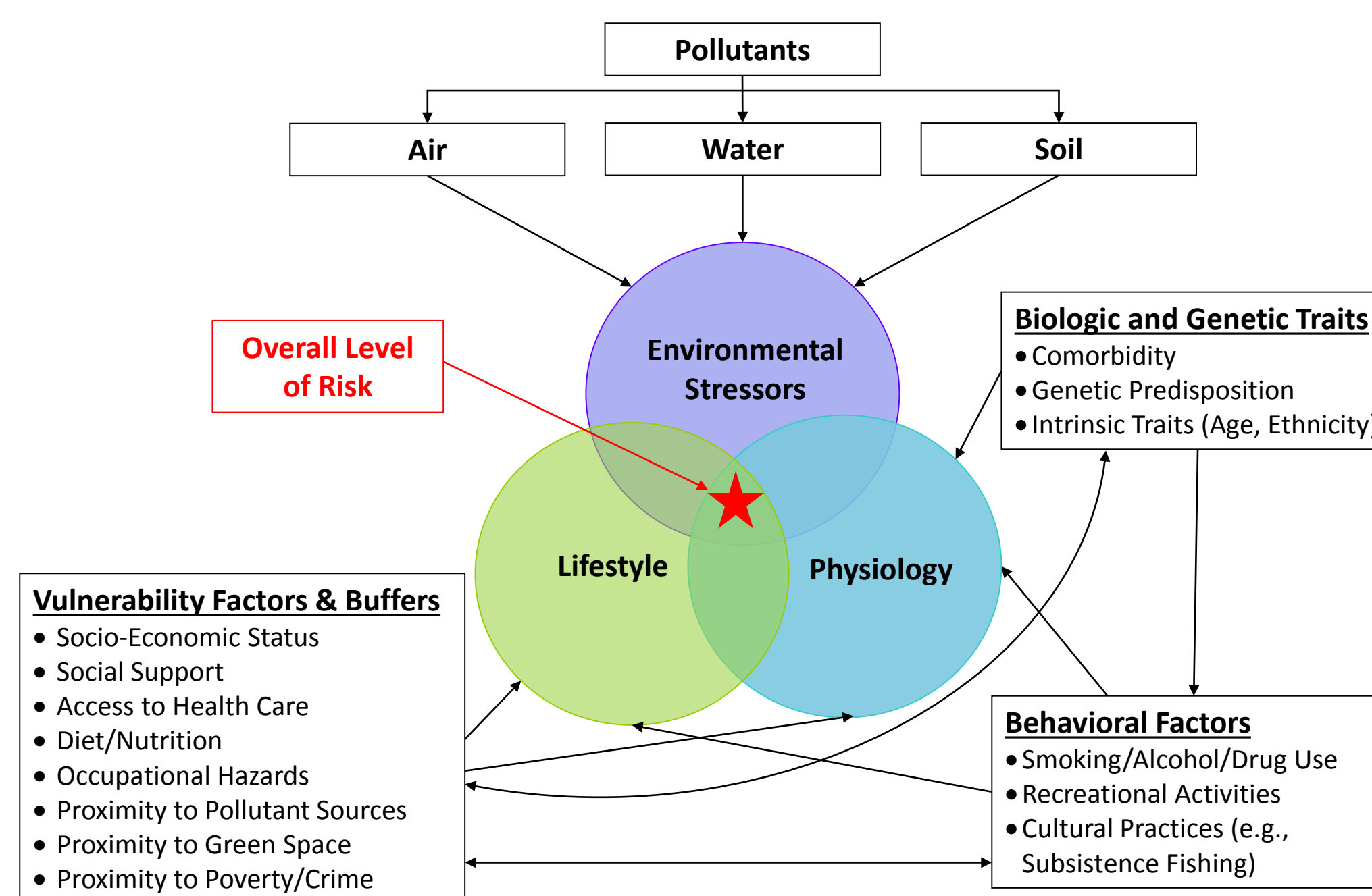
Figure 2. Human Health and Ecological Risk Assessment Stressors and Buffers



## Project Objectives

- Improve the integration of cross-species (e.g., ecological and human health) data into CRAs
- Incorporate data on susceptible populations into CRA to inform risk characterization
- Improve characterization of risk and exposure (across multiple media, sources, and biota) to chemical and nonchemical stressors

Figure 3. Impact of Vulnerability Factors on Risk Characterization of Multimedia Pollutants



## Task Objectives

- Task 6.1. Approaches to Cross-Species Data Integration to Support CRA:** Explore new approaches for integration of human and ecological data such as AOP and how these techniques may be applied to CRA in multi-criteria decision analysis.
- Task 6.2. Incorporating Multiple Stressors:** Develop CRA methods and case studies that evaluate exposures, assess dose-response, and characterize risks posed by multiple chemical and nonchemical stressors to human health.
- Task 6.3. Incorporating Susceptibility Information into CRA:** Apply emerging molecular data (e.g., epigenetic and genomic) to inform susceptibility and variability in response to environmental chemicals for risk assessment.
- Task 6.4. Apportioning Multimedia Exposure and Risk Across Human and Ecological Receptors:** Focus on relationships among multiple stressors and their sources to human and ecologic receptors for the purpose of apportioning risk.

### Relationship to Project Objectives

Task 6.1 will explore how both human and ecological data can be considered together to advance CRAs. Tasks 6.2 and 6.3 will consider the issues of susceptibility and effect modification related to nonchemical stressors. Task 6.4 will address scientific challenges regarding integration of exposure assessment considerations for multiple stressors for CRA.

### Relationship to Other Projects and Tasks

Products should aid technical support efforts (Project 5) and be useful to HHRA assessments (Projects 1, 3, 4) that consider susceptible populations. Results may also inform methodological research on Exposure Assessment, Hazard Identification, and Dose-Response Characterization addressed in Projects 7 and 8.

## Impact

### Short-Term (FY16 – FY17): Increasing Agency CRA Capacity

- Regional and program office support via technical assistance, guidance, and CRA case study application
- Scientific workshops to provide instruction, convene experts, facilitate training and accelerate applications of CRA methods

### Long-Term (FY18 – FY19): Advancing the Science Behind Cumulative Risk Assessment Efforts

- Integration of both human and ecological health data in CRA applications through examination of common endpoints, mechanistic pathways, multi-media exposures, and the impact of ecosystem services on human health (e.g., green space workshop)
- Improved characterization of risk and exposure to chemical and nonchemical stressors among susceptible populations (e.g., epigenetic modification research)

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