

Heavy Metal Bioaccumulation in Vegetables and Associated Health Risks in Savar, Bangladesh

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Abstract:

Vegetables grown near industrial areas in Savar, Bangladesh, show alarming heavy metal contamination, posing significant public health risks. This study measured six toxic metals (As, Cd, Cr, Ni, Pb, Hg) in vegetables, soil, and irrigation water using ICP-MS and AAS. Soil contained high Pb (19.26 mg/kg) and Hg (16.92 mg/kg), while irrigation water exceeded WHO limits for Pb (0.15 mg/L), Cd (0.02 mg/L), and Hg (0.02 mg/L). Among vegetables, Pb was highest in brinjal (14.48 mg/kg), Cd in spinach (2.37 mg/kg), and As in pumpkin leaf (0.145 mg/kg). Bioaccumulation was greatest for Cd in spinach (1.26) and Pb in brinjal (0.75), indicating high mobility. Health risk assessment revealed extremely elevated hazard indices in children for Pb (25.68) and Cd (16.81), far above safe limits. Strong correlations ($r > 0.70$) confirm industrial pollution as the main source.

Keywords: Heavy metal · Wastewater irrigated Vegetables · Bioaccumulation · ICP-MS · Health risk assessment · Industrial pollution



1. INTRODUCTION

- Industrial pollution increases heavy metals in soil & water.
- Vegetables absorb these toxic metals.
- Long-term exposure → cancer, kidney damage, neurological issues.



2. PROBLEM & OBJECTIVES



Problem:
Unsafe vegetables due to heavy metals

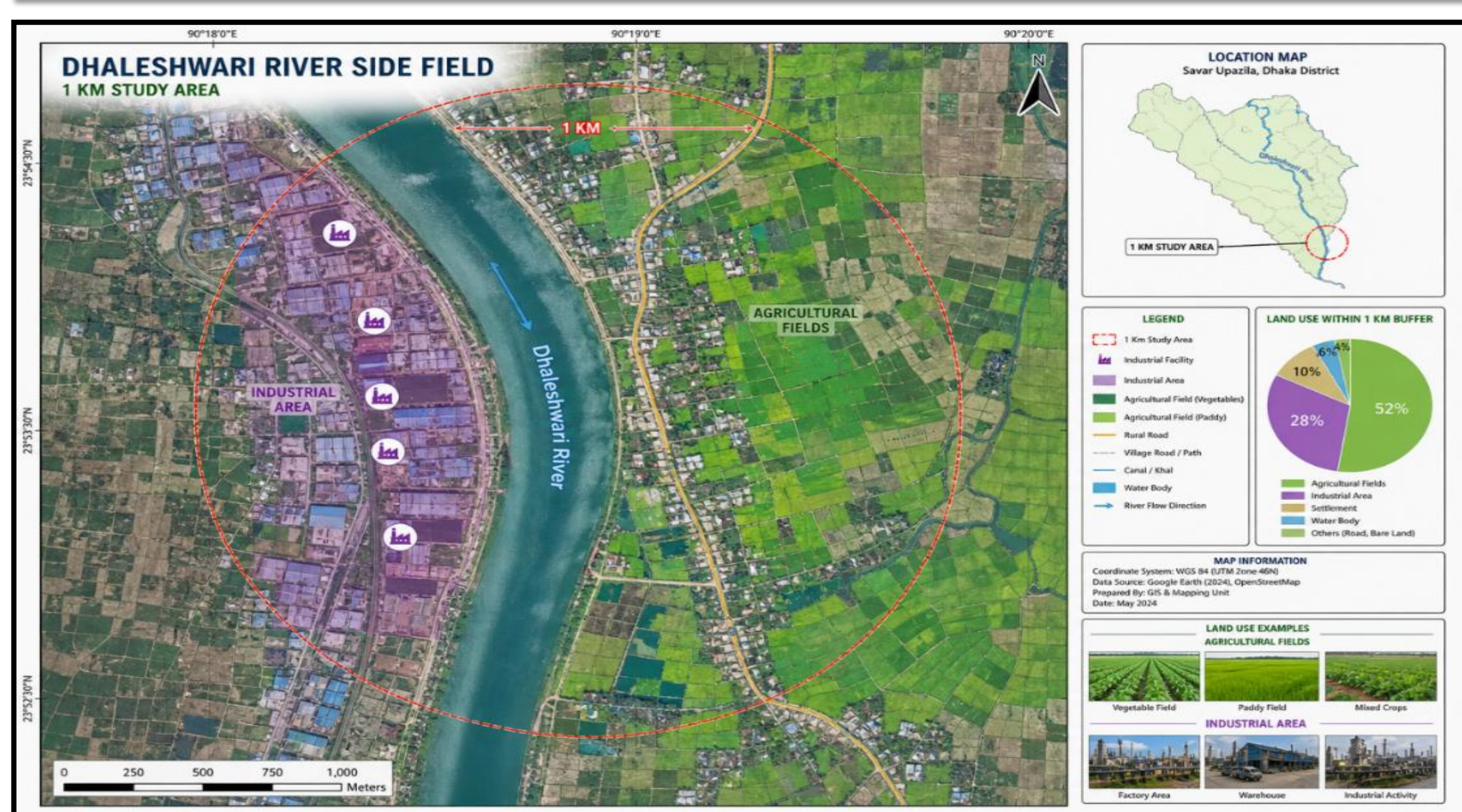
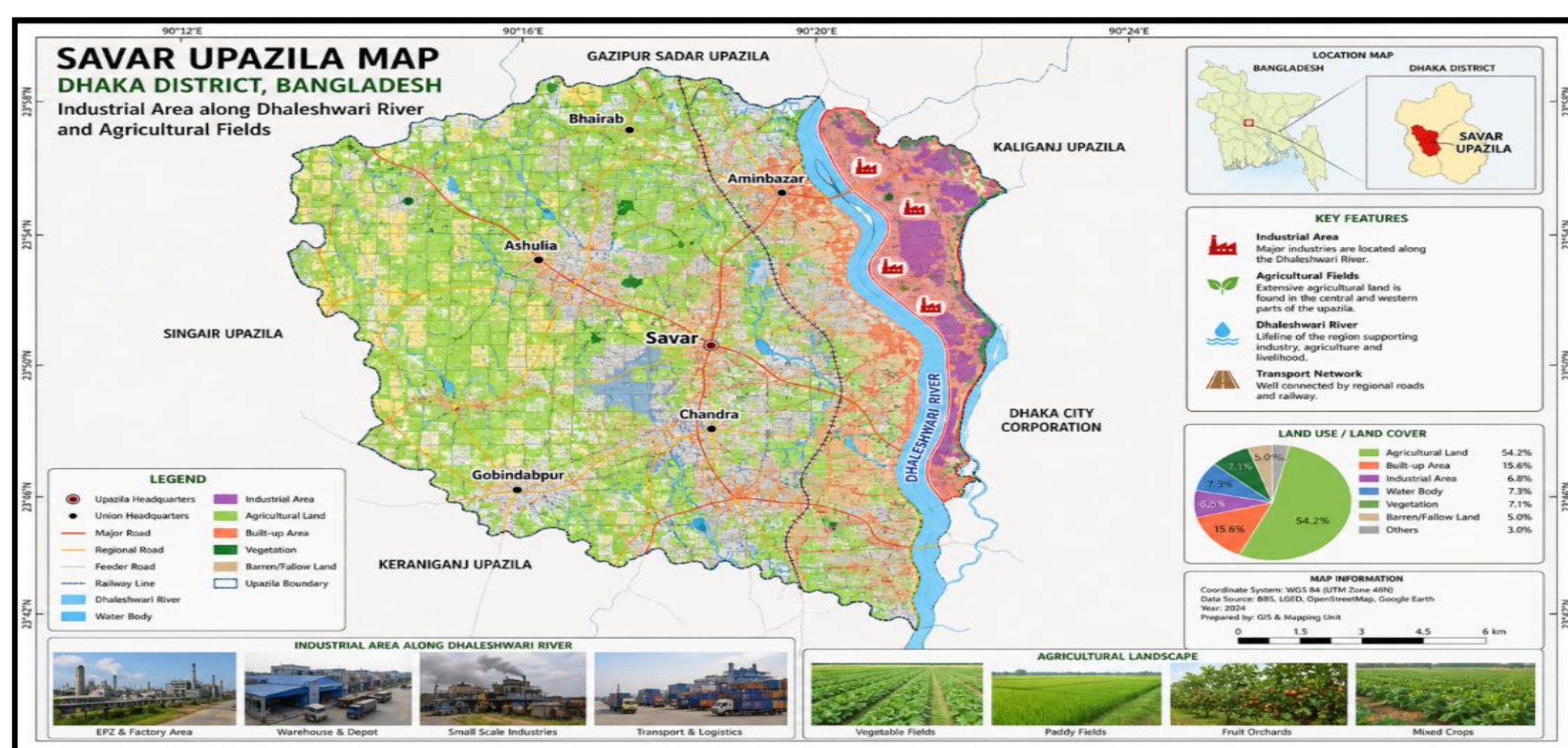


Objectives:

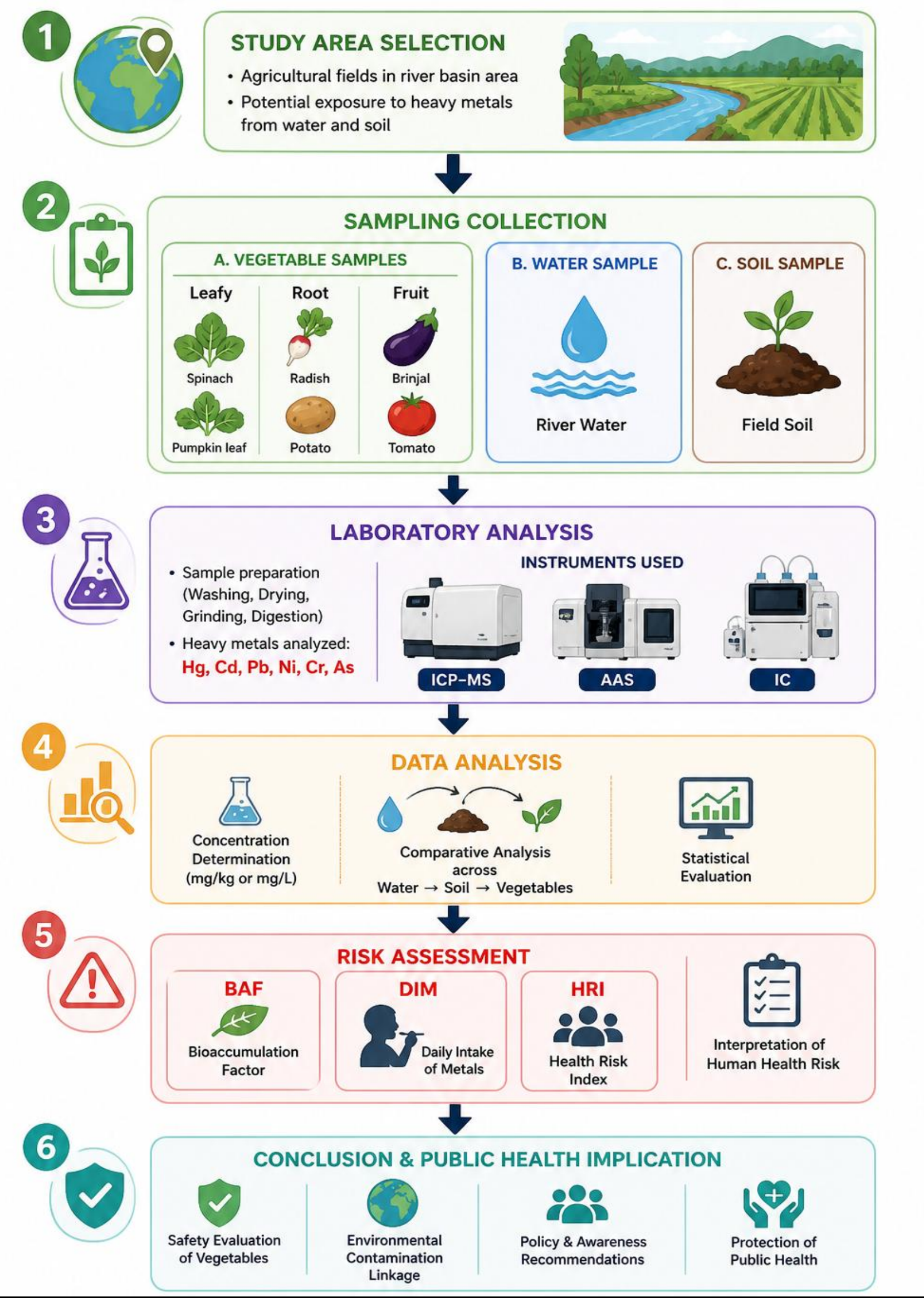
- Measure heavy metals (As, Cd, Pb, Hg, etc.)
- Evaluate bioaccumulation
- Assess human health risk



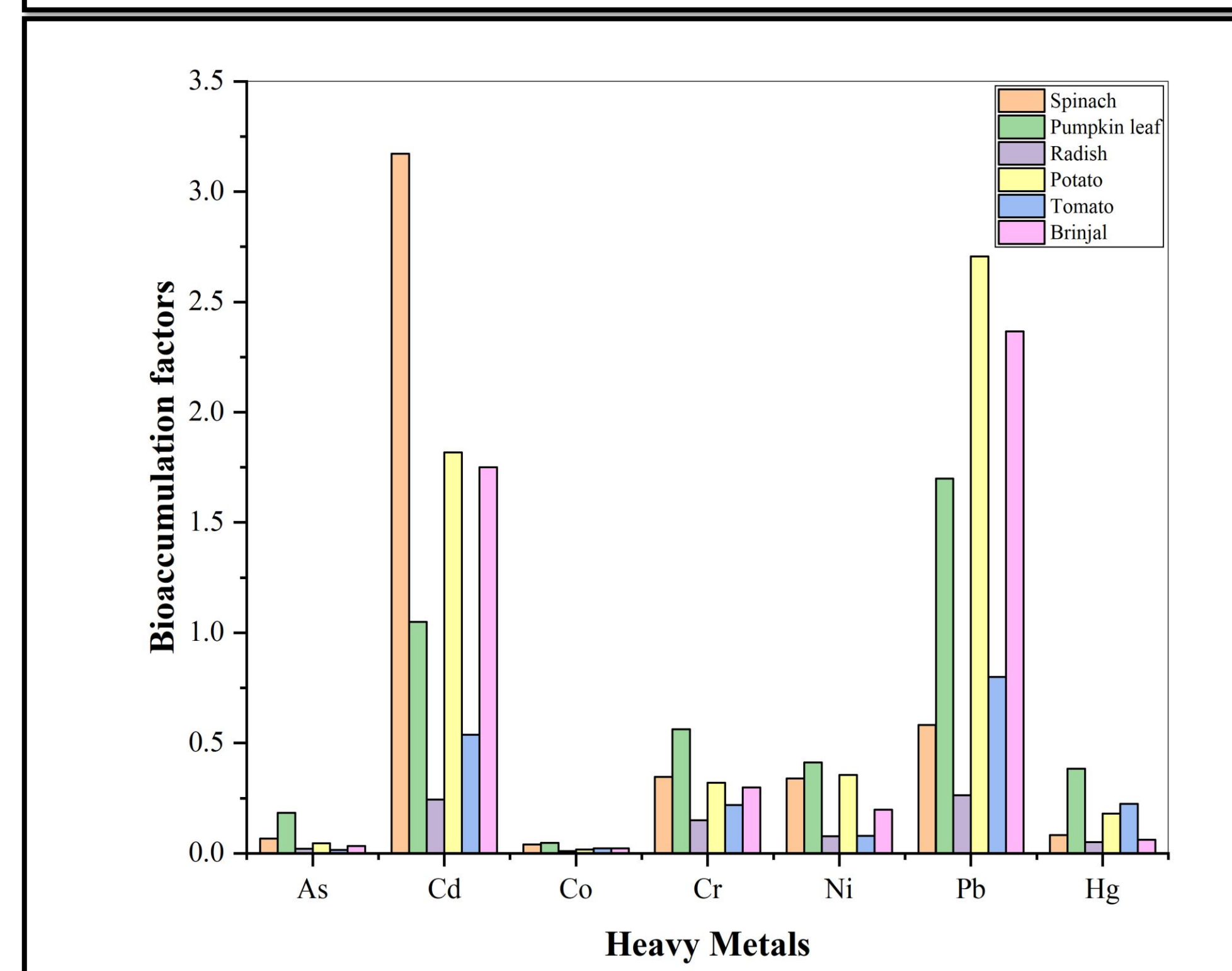
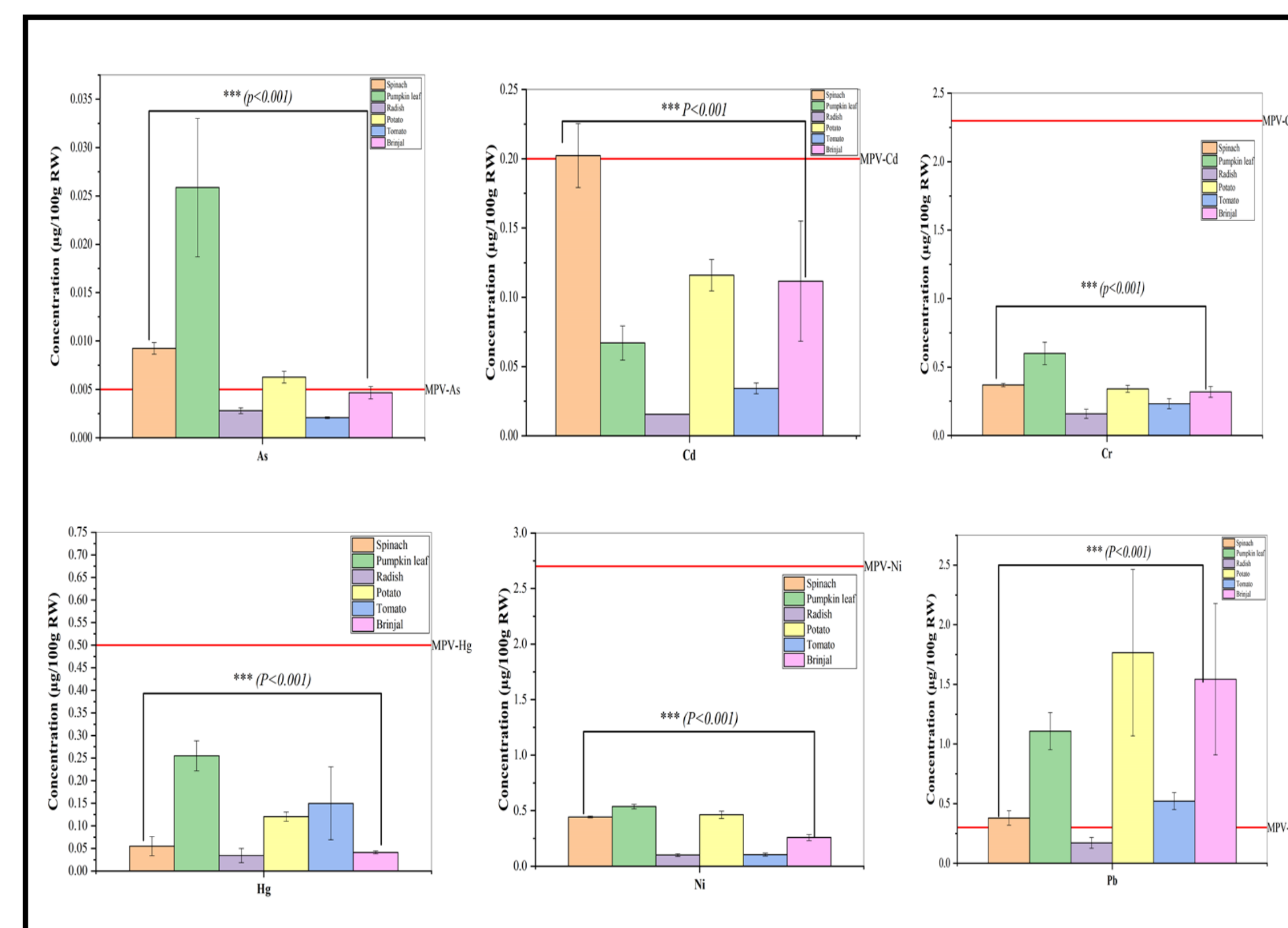
3. METHODOLOGY



METHODOLOGY



4. RESULT

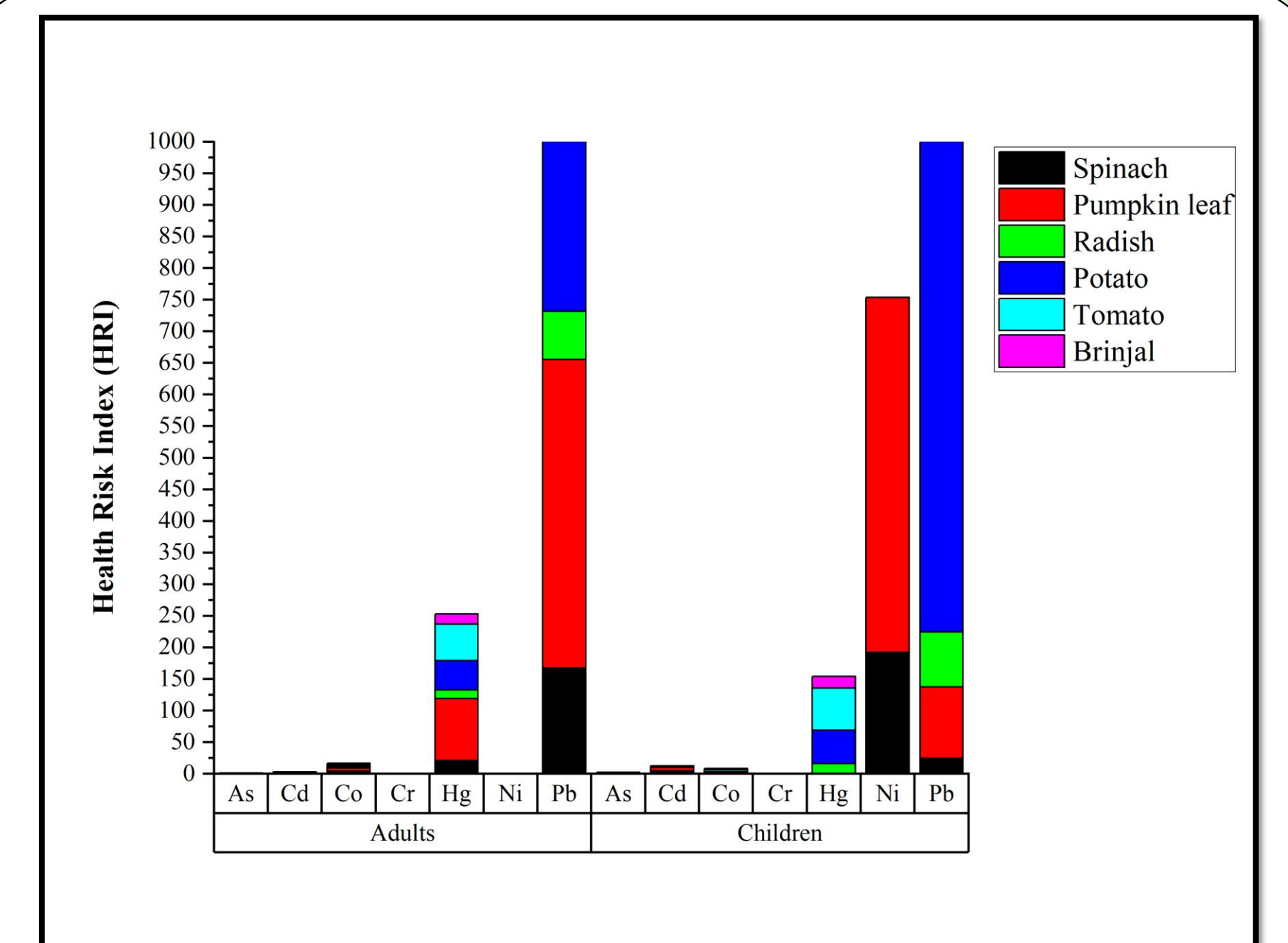


HEALTH RISK ALERT!

Pb Pb HRI = 25.68 → **EXTREME RISK**

Cd Cd in Spinach → **HIGH EXPOSURE**

— HIGH PRIORITY · ENVIRONMENTAL HEALTH CONCERN —



PROBABLE HEALTH RISKS DUE TO HEAVY METALS IN VEGETABLES IF EXPOSURE IS NOT CONTROLLED

Heavy metals accumulate in the body over time and can damage vital organs, leading to serious and long-term health problems.

<p>As (ARSENIC)</p> <p>TARGET ORGANS: Skin, Lungs, Liver, Bladder, Nervous System</p> <p>HEALTH PROBLEMS: Skin lesions, pigmentation, Respiratory problems, Liver damage, Neurological disorders, Cardiovascular disease</p>	<p>Pb (LEAD)</p> <p>TARGET ORGANS: Brain, Nervous System, Blood, Kidneys, Reproductive System</p> <p>HEALTH PROBLEMS: Reduced IQ, learning and behavioral problems (especially in children), Anemia, Kidney damage, High blood pressure, Reproductive issues</p>
<p>Cd (CADMIUM)</p> <p>TARGET ORGANS: Kidneys, Bones, Lungs, Liver, Reproductive System</p> <p>HEALTH PROBLEMS: Kidney damage/failure, Bone demineralization (osteoporosis), Respiratory issues, Liver dysfunction, Reproductive toxicity</p>	<p>Hg (MERCURY)</p> <p>TARGET ORGANS: Brain, Nervous System, Kidneys, Lungs, Digestive System</p> <p>HEALTH PROBLEMS: Neurological damage, Memory loss, tremors, Kidney dysfunction, Digestive issues, Vision and hearing impairment</p>
<p>Cr (CHROMIUM)</p> <p>TARGET ORGANS: Lungs, Liver, Kidneys, Nervous System</p> <p>HEALTH PROBLEMS: Respiratory irritation, Asthma, bronchitis, Liver and kidney damage, Skin ulcers, allergic reactions, Weakened immune system, Possible carcinogenic risk</p>	<p>Ni (NICKEL)</p> <p>TARGET ORGANS: Lungs, Skin, Immune System</p> <p>HEALTH PROBLEMS: Respiratory problems, Asthma, chronic bronchitis, Skin dermatitis, allergies, Weakened immune system, Possible carcinogenic risk</p>

KEY MESSAGE: Heavy metals do not break down in the body. They accumulate and cause irreversible damage over time.

MOST VULNERABLE: Children, Pregnant Women, Elderly People

PREVENTION IS PROTECTION: Control industrial pollution, Regular monitoring of soil, water & vegetables, Safe consumption for a healthy future.

SAFE FOOD TODAY, HEALTHY GENERATIONS TOMORROW.



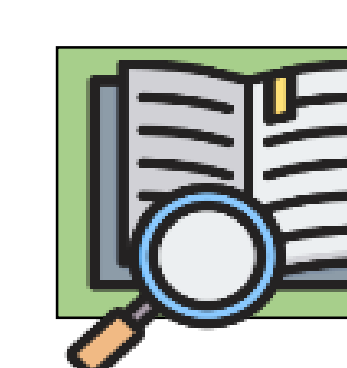
5. DISCUSSION

- Industrial wastewater = main contamination source
- Leafy vegetables absorb more metals
- Children are highly vulnerable



6. CONCLUSION

- Vegetables unsafe for consumption
- Urgent need for:
 - Pollution control
 - Safe irrigation
 - Regular monitoring



7. REFERENCES

