

PROJECT MODUL'AIR



Aerodyne Research



Olin College of Engineering
SCOPE

WHY AIR QUALITY?

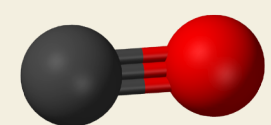
THE WORLD HEALTH ORGANIZATION defines air pollution as the contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere¹.

INDUSTRIAL FACILITIES, HOUSEHOLD COMBUSTION DEVICES, FOREST FIRES and MOTOR VEHICLES are some common sources of man-made air pollution.

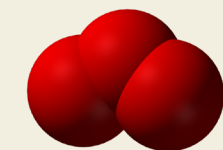
MAJOR POLLUTANTS:



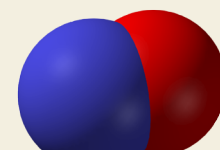
Particulate Matter (PM_{2.5}, PM₁₀)



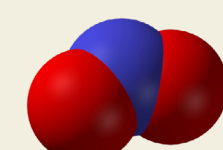
Carbon Monoxide (CO)



Ozone (O₃)



Nitric Oxide (NO)



Nitrogen Dioxide (NO₂)

HEALTH EFFECTS DUE TO AIR POLLUTION:

HEART:
Heart Attacks
Anxiety
Strokes
Heart Disease
Congestive Heart Failure

LUNGS:
Lung Cancer
Chronic Bronchitis
Asthma
Emphysema
Scarred Lung Tissue

BRAIN:
Headaches
Anxiety
Central Nervous System Impairment

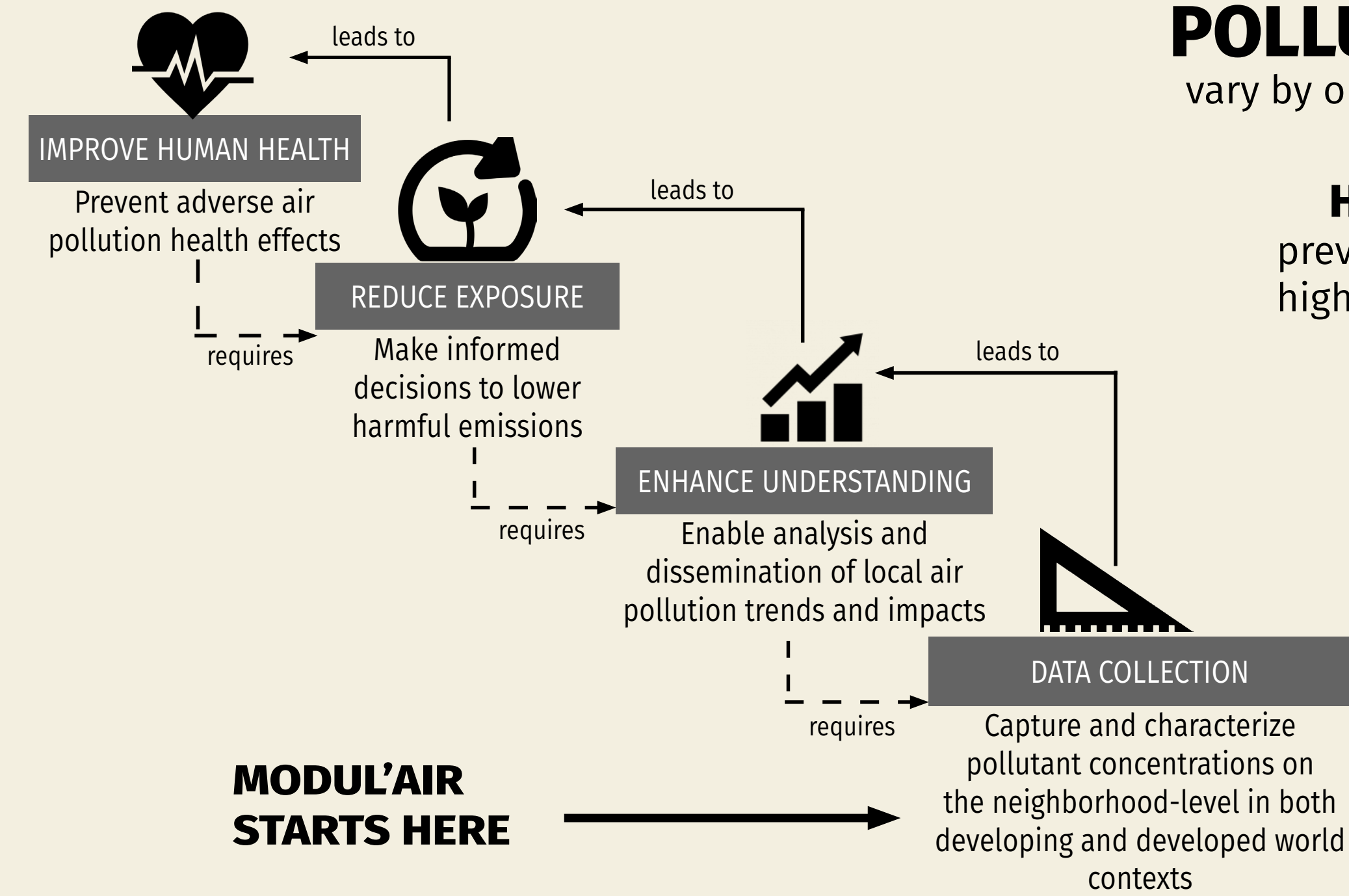
FETUS:
Birth Defects
Low Birth Weight

In 2012, Air pollution was responsible for **6.5 million deaths**, or **11.6%** of all global deaths²

1 in 8 premature deaths are caused by air pollution²

[1] "Air Pollution." World Health Organization. World Health Organization. Web. 27 Apr. 2017.
[2] "WHO releases country estimates on air pollution exposure and health impact." World Health Organization. World Health Organization. Web. 27 Apr. 2017.

PROJECT MOTIVATION:



POLLUTANT CONCENTRATIONS

vary by orders of magnitudes over short distances (10-100m) and fast timescales (<60s).

HOWEVER, current air quality measurements prevent this fine-scale understanding, due to the high cost and complexity of pollution monitoring equipment.

THUS, we need cheaper, mobile-ready devices that allow for improved resolution of pollutant concentrations in space and time.

CURRENTLY: MODUL'AIR:



MODUL'AIR FEATURES:

| | | |
|--------------------------|---------------------------|----------------|
| HIGH SPATIAL VARIABILITY | HIGH TEMPORAL VARIABILITY | LOW COST |
| SMALL FOOTPRINT | INFORMATION DISSEMINATION | RESEARCH-GRADE |

PROTOTYPE:

MODUL'AIR utilizes Autodesk Fusion 360's full suite of tools to allow for iterative and collaborative CAD'ing of our mechanical design. In addition, we wrote custom, extensible firmware to enable portable, remote data collection and designed the electrical system to seamlessly support maximum runtime. Lastly, we set up a web interface to allow access to real-time data.

- RESEARCH-GRADE DATA:** Installed sensors measure all of the **MAJOR POLLUTANTS**
- EASY HANDLING:** Handle for carrying or attaching to bikes or drones
- ACCESSIBLE:** Removable encasing for accessing boards and sensors
- MODULAR:** Detachable optical particle counter and electrochemical sensors
- UNTETHERED MOBILITY:** Rechargeable Battery Pack
- SMALL FORM FACTOR:** 12"Dx5.5"Hx4"L and ~2.5lbs
- REAL-TIME DATA:** Cell modem for cloud-connected data management

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