Utilizing Low Cost Sensors to Measure Particulate Matter

Graduation project II — *Thursday, December 22, 2016*

Introduction:

Indoor air pollution:

presence in the indoor of one or more contaminants, such as dust, fumes, gas, mist, odor, smoke, or vapor in quantities of characteristics and of duration such as to injurious to human, plant, or animal life or to property or which unreasonably interferes with the comfortable enjoyment of life and property.

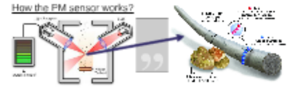
Common Indoor Air Problems

Methodology:

How did we collecting data?

By use shinyei sensor:
low cost device to measure particulate matter using PPD42NS particulate matter sensor that deal with (PM) in different colleges at an-najah national university like engineering, medicine, arts, information technology and in houses.

How the PM sensor works?



Results and discussion:

place	max. value	avg. value
cooking activities	16.55	4.12
combustion activities	63.27	15.53
outdoor particle	22.16	2.75
moving activities	27.33	7.74

Combustion activities > cooking activities > moving activities > outdoor particles.

Conclusion Recommendations:

- Enhance of basic studies.
- Creat awareness in the communities and enhance the culture between people which say some of activities that we work it always may be cause indoor air pollution in addition to contribute to kill people, we can't make control now, because process of control need a long-term research (5 – 10 years).

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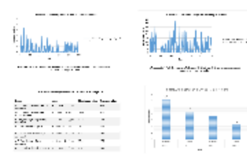

Discussion:

- Human health
- Building design

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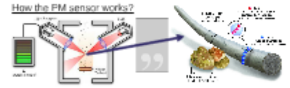

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place	max. value	avg. value
cooking activities	26.55	4.12
combustion activities	62.27	15.53
outdoor particle	22.16	2.75
moving activities	27.33	7.74

Combustion activities > cooking activities > moving activities > outdoor particles.

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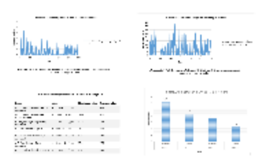

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Common Indoor Air Problems

Moisture

VOCs and Chemicals

Smoking

Dust

Pet Dandor

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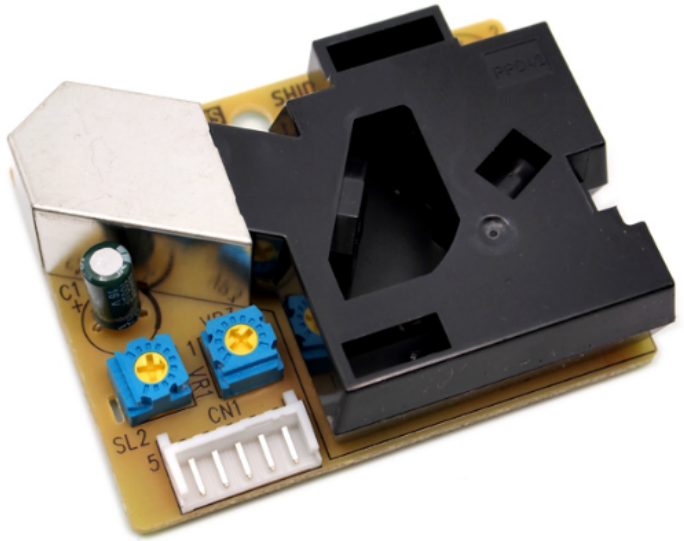

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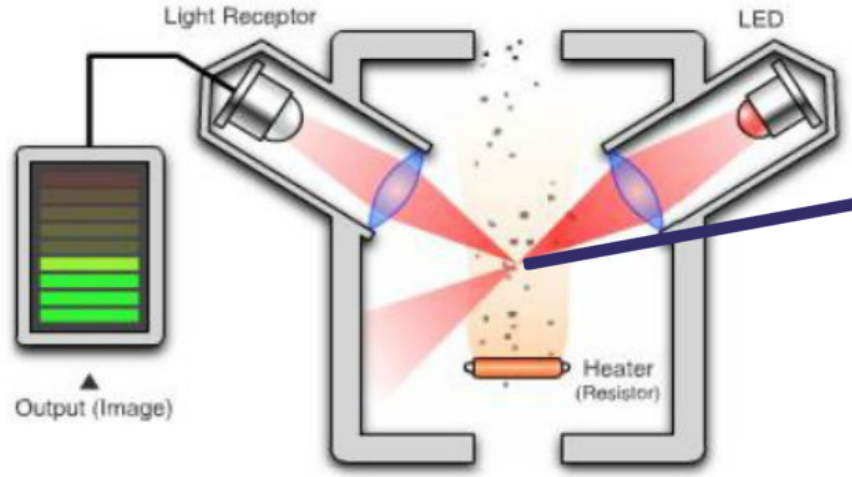

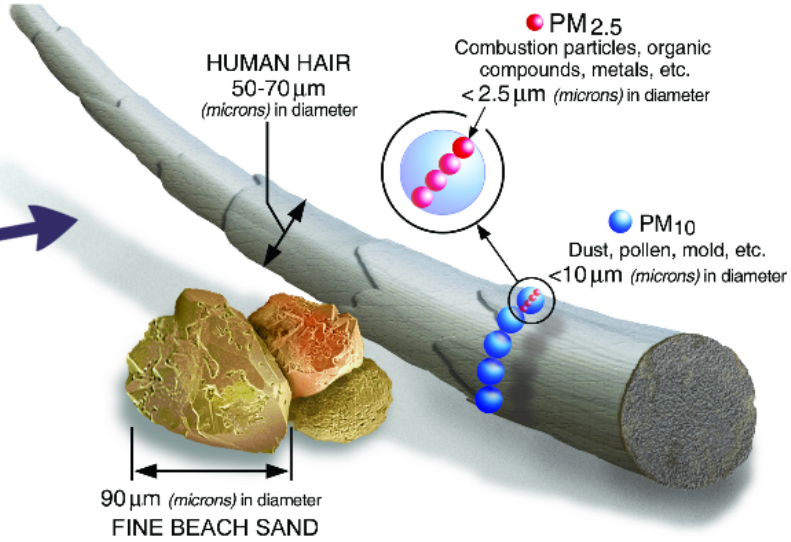

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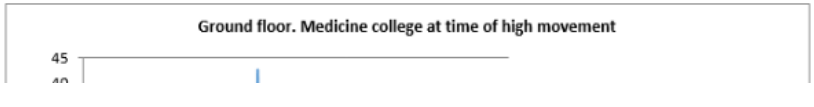
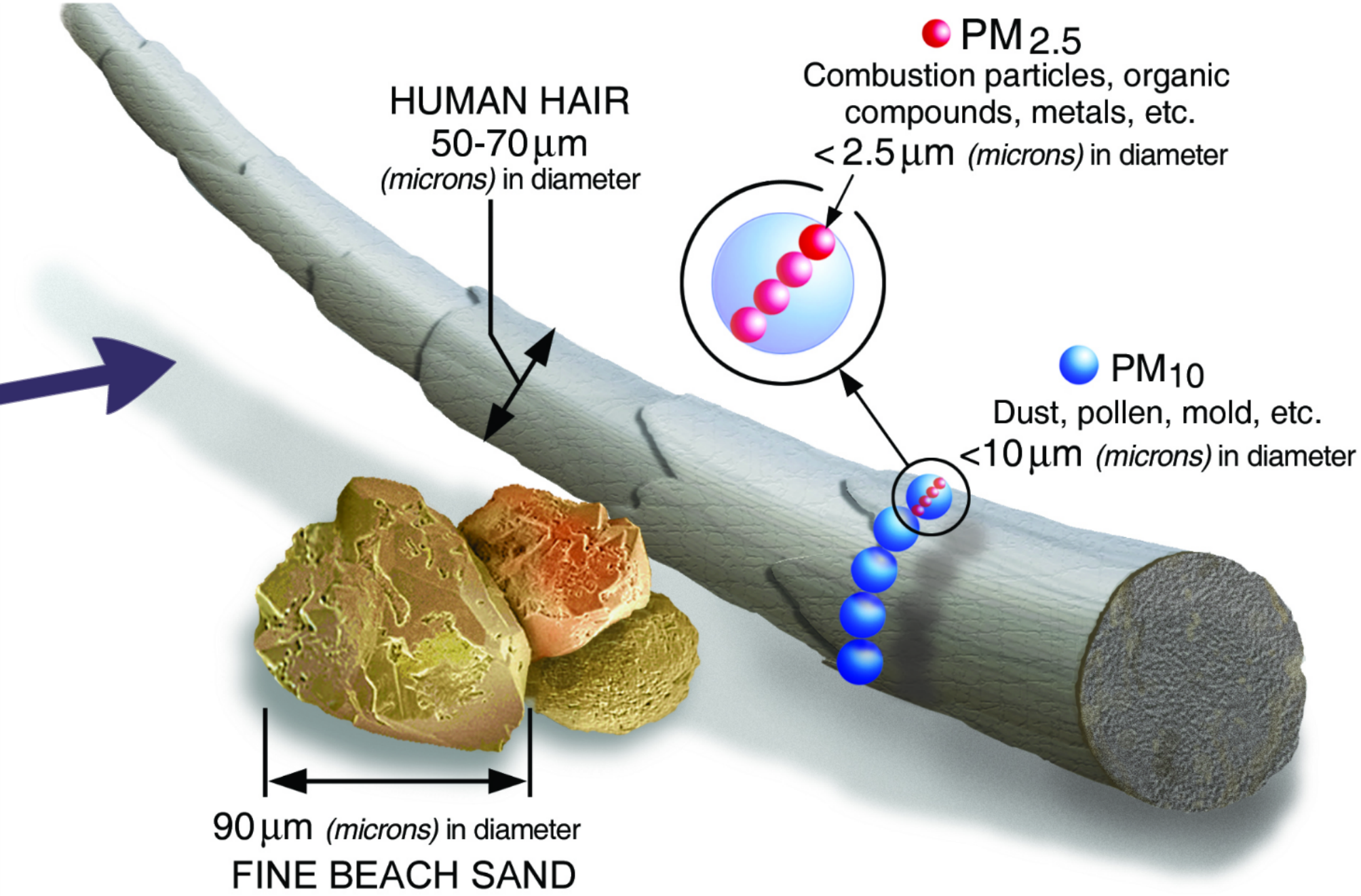
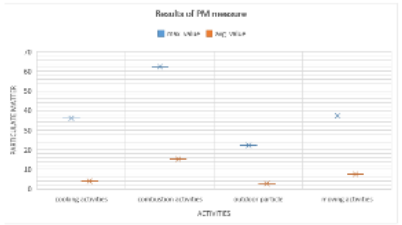


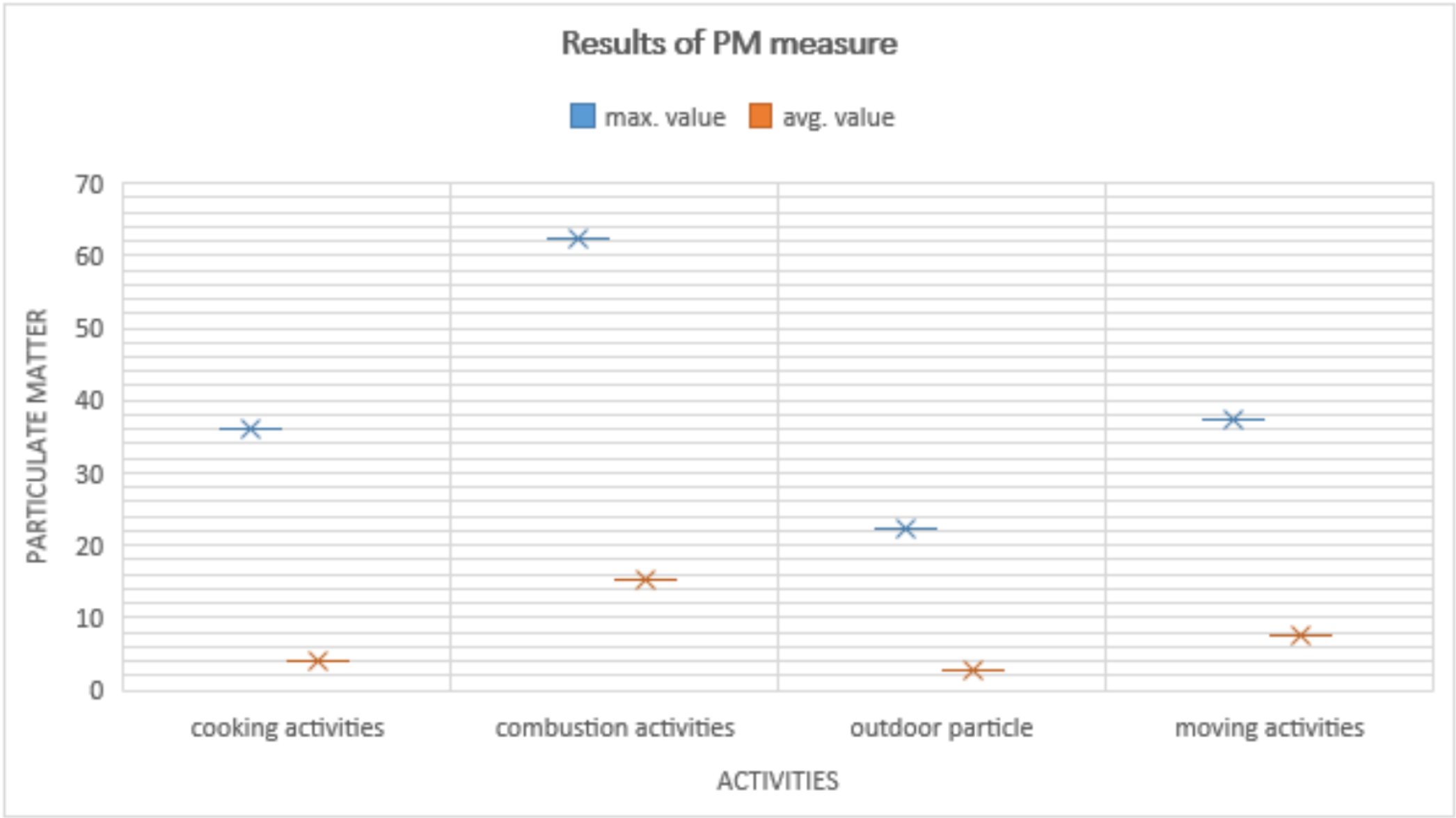

PM2.5
Combustion particles, organic compounds, metals, etc.
< 2.5 µm (microns) in diameter
HUMAN HAIR
50-70 µm
(microns) in diameter
PM10
Dust, pollen, mold, etc.
<10 µm (microns) in diameter
90 µm (microns) in diameter
FINE BEACH SAND

Results and discussion:



place	max. value	avg. value
cooking activities	35.95	4.13
combustion activities	62.27	15.23
outdoor particle	22.16	2.75
moving activities	37.38	7.74

Combustion activities > cooking activities > moving activities > outdoor particles


Results of PM measure
max. value
avg. value
70
60
50
40
30
20
10
0
PARTICULATE MATTER
cooking activities
combustion activities
outdoor particle
moving activities
ACTIVITIES

Results:

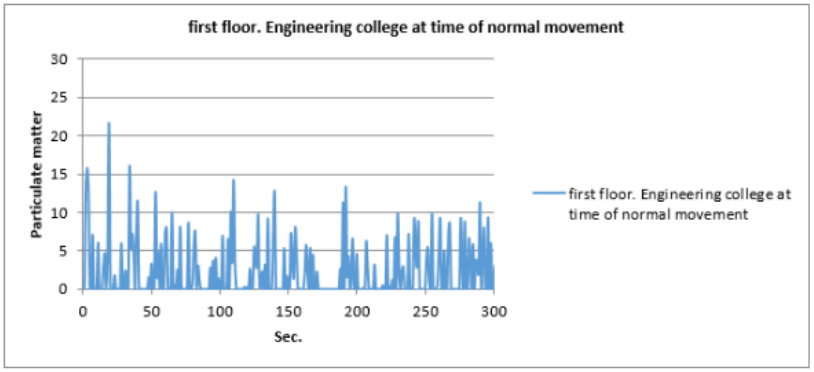


Diagram 2.4: Particles size distributions in F1.Engineering College in normal movement at (2:00 – 2:05) pm o'clock

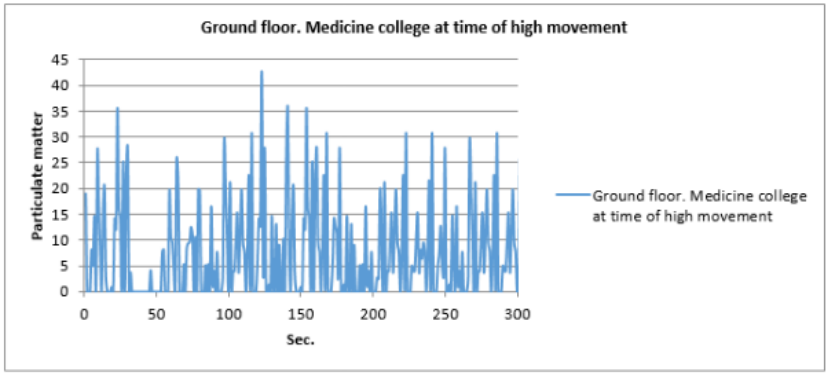
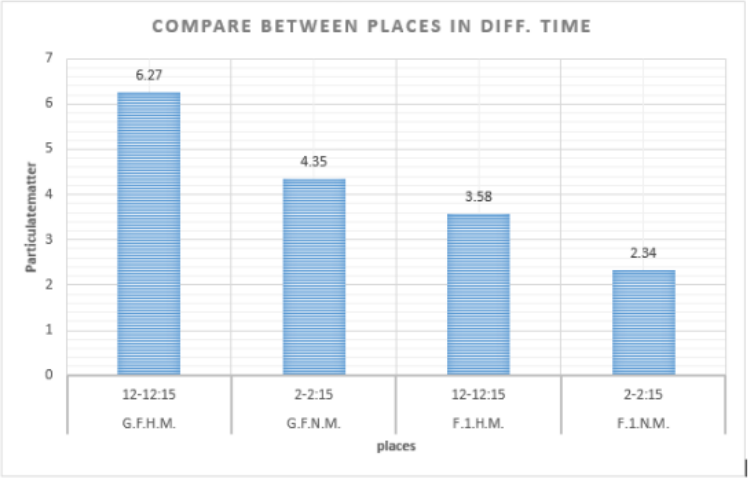
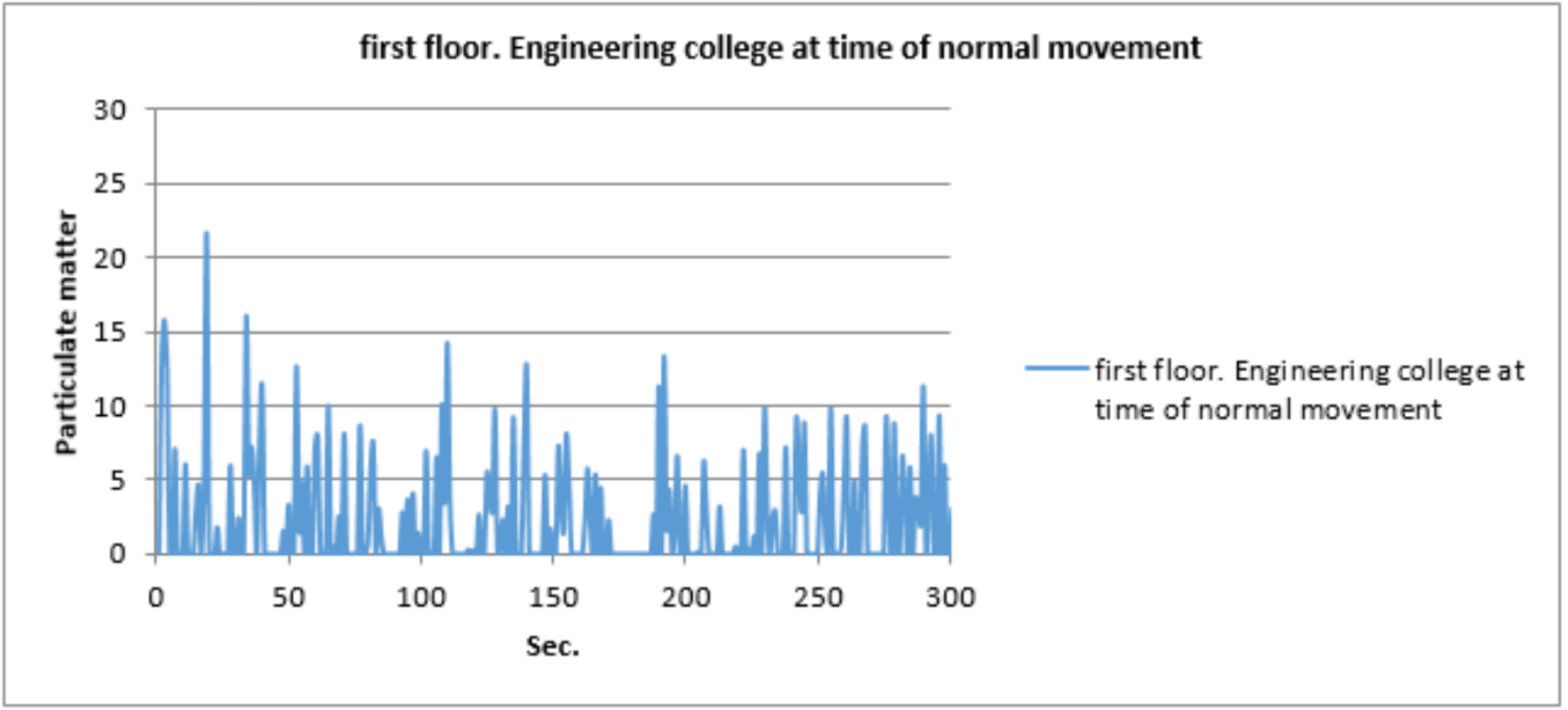


Diagram 2.5: Particles size distributions in GF.Medicine College in high movement at (12:00 – 12:05) pm o'clock

Tables 3.1: summary of particles matter values in different places

Place	Time	Maximum value	Average value
G.F..Engineering College in high movement	at (12:00 – 12:15) pm	50.3	6.27
G.F..Engineering College in normal movement	at (2:00 – 2:15) pm	31.06	4.35
F.1.Engineering College in high movement	at (12:00 – 12:15) pm	40.38	3.58
F.1.Engineering College in normal movement	at (2:00 – 2:15) pm	21.71	2.34
G.F..Medicine College in high movement	at (12:00 – 12:15) pm	42.6	7.13
G.F..Arts College in high movement	at (12:00 – 12:15) pm	52.01	5.23
G.F. IT College in high movement	at (12:00 – 12:15) pm	20.65	3.17





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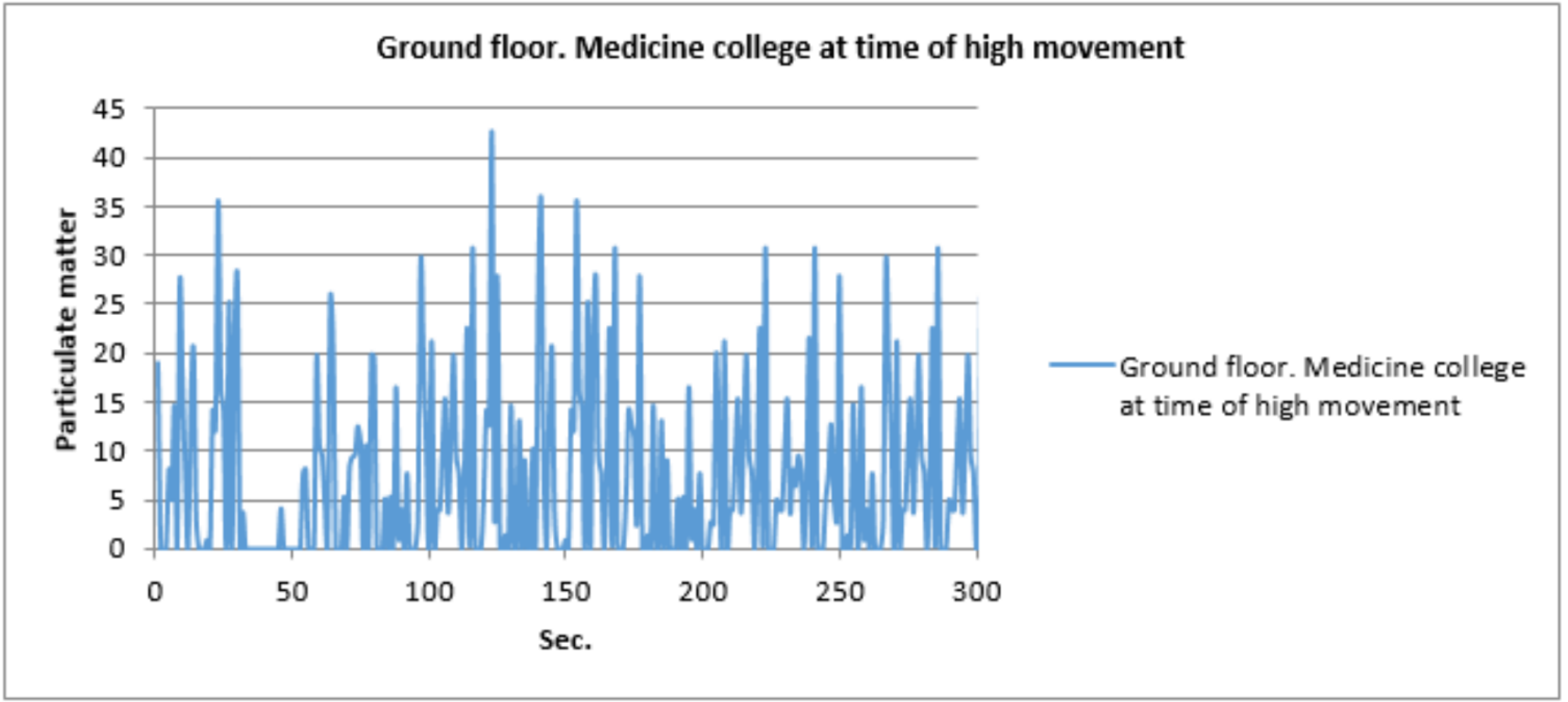

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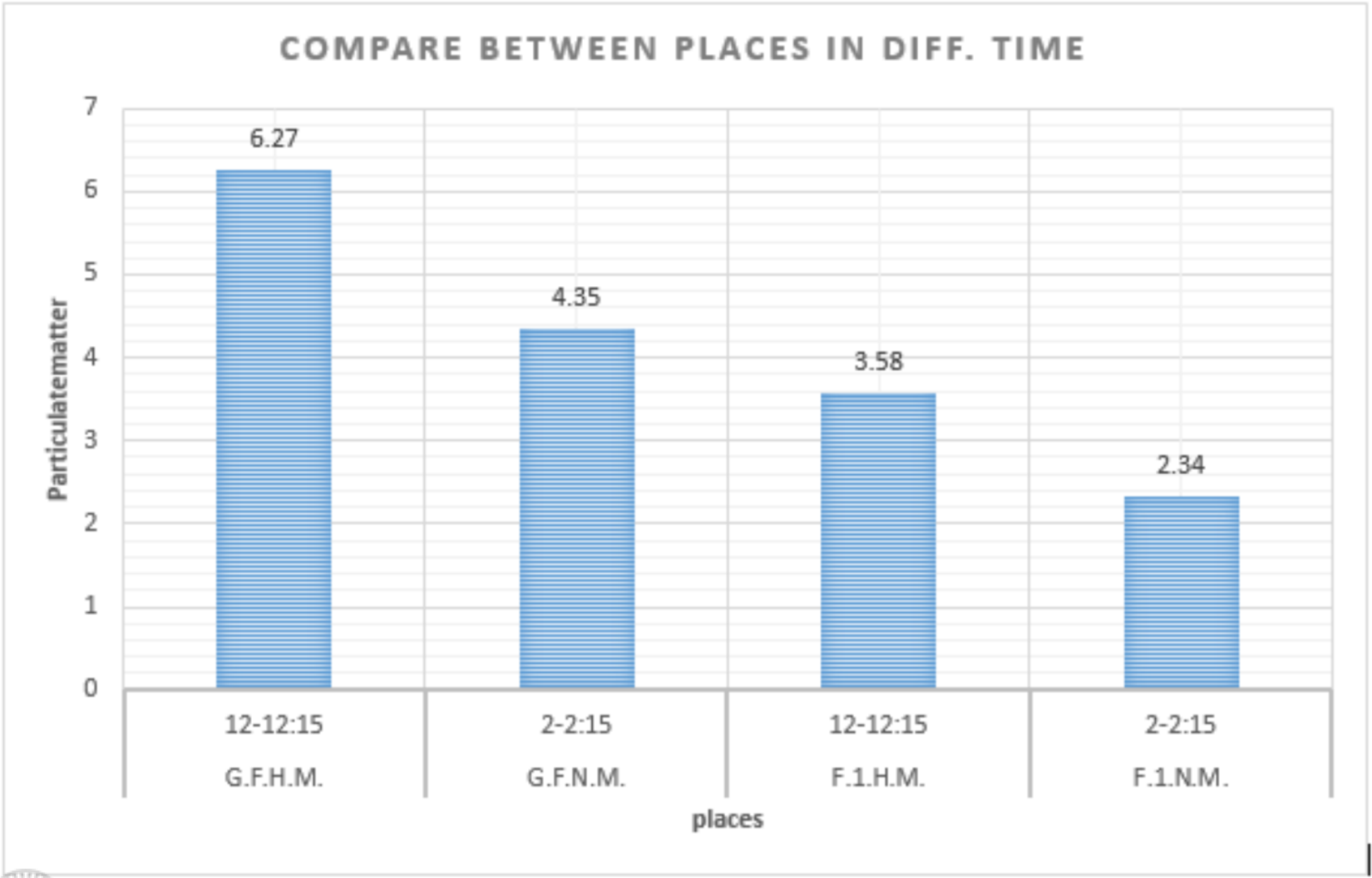
COMPARE BETWEEN PLACES IN DIFF. TIME
Particulatematter
7
6
5
4
3
2
1
0
6.27
4.35
3.58
2.34
12-12:15
G.F.H.M.
2-2:15
G.F.N.M.
12-12:15
F.1.H.M.
2-2:15
F.1.N.M.
places

Discussion !!

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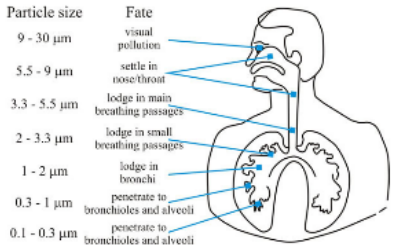
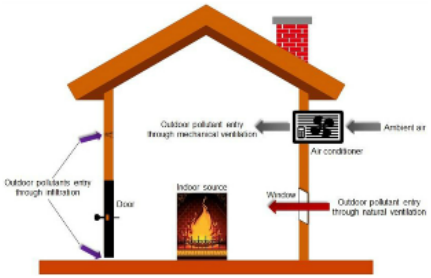
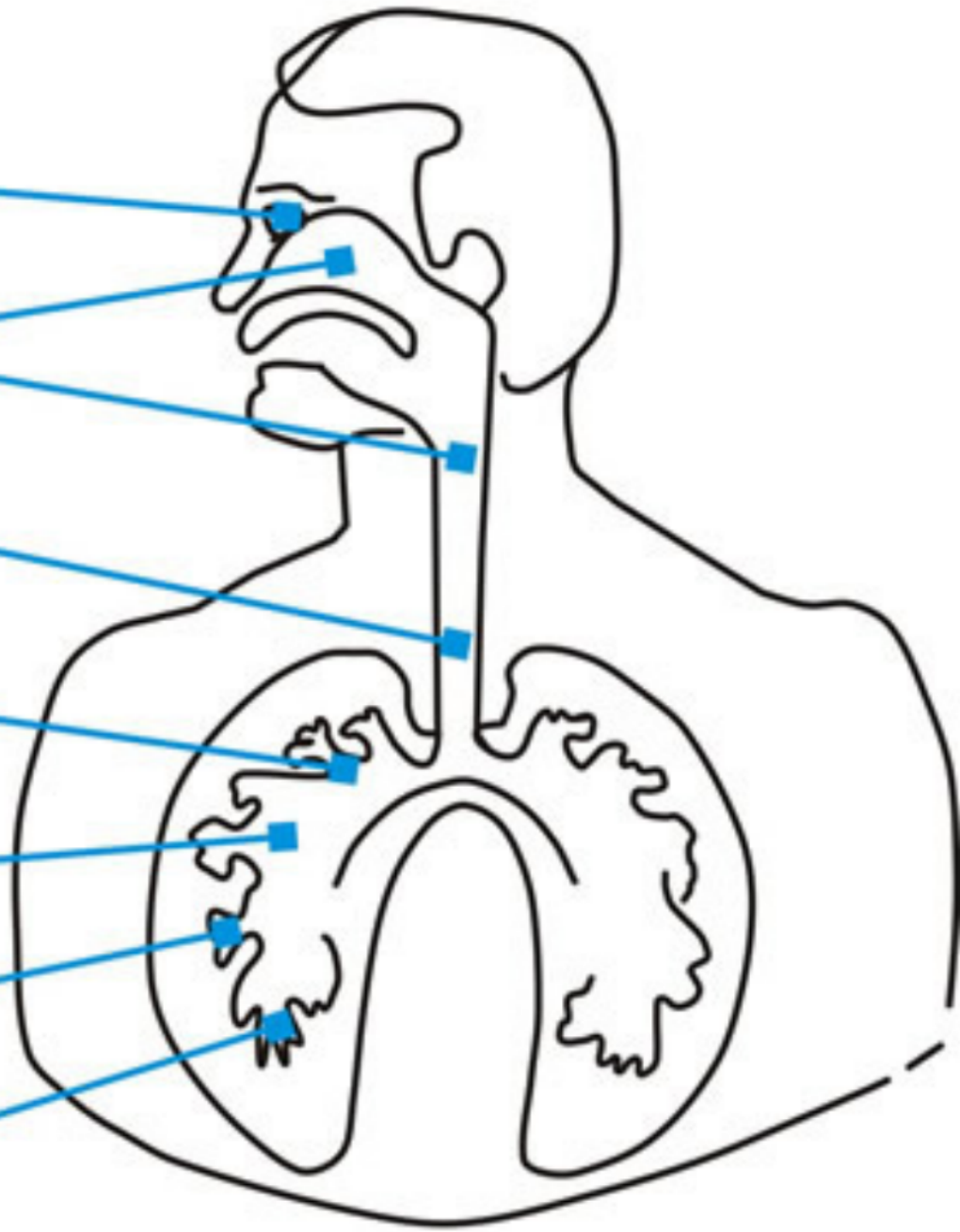


- Human health.



- Building design.

Particle size	Fate
9 - 30 μm	visual pollution
5.5 - 9 μm	settle in nose/throat
3.3 - 5.5 μm	lodge in main breathing passages
2 - 3.3 μm	lodge in small breathing passages
1 - 2 μm	lodge in bronchi
0.3 - 1 μm	penetrate to bronchioles and alveoli
0.1 - 0.3 μm	penetrate to bronchioles and alveoli



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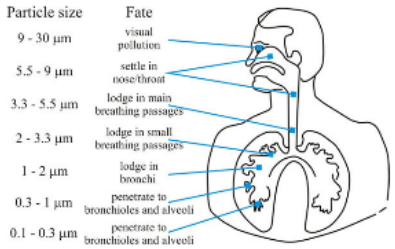

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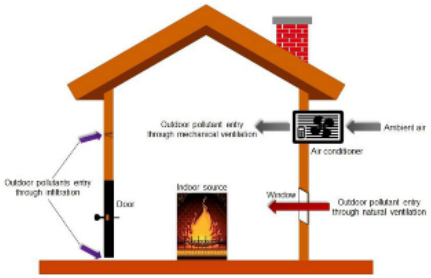

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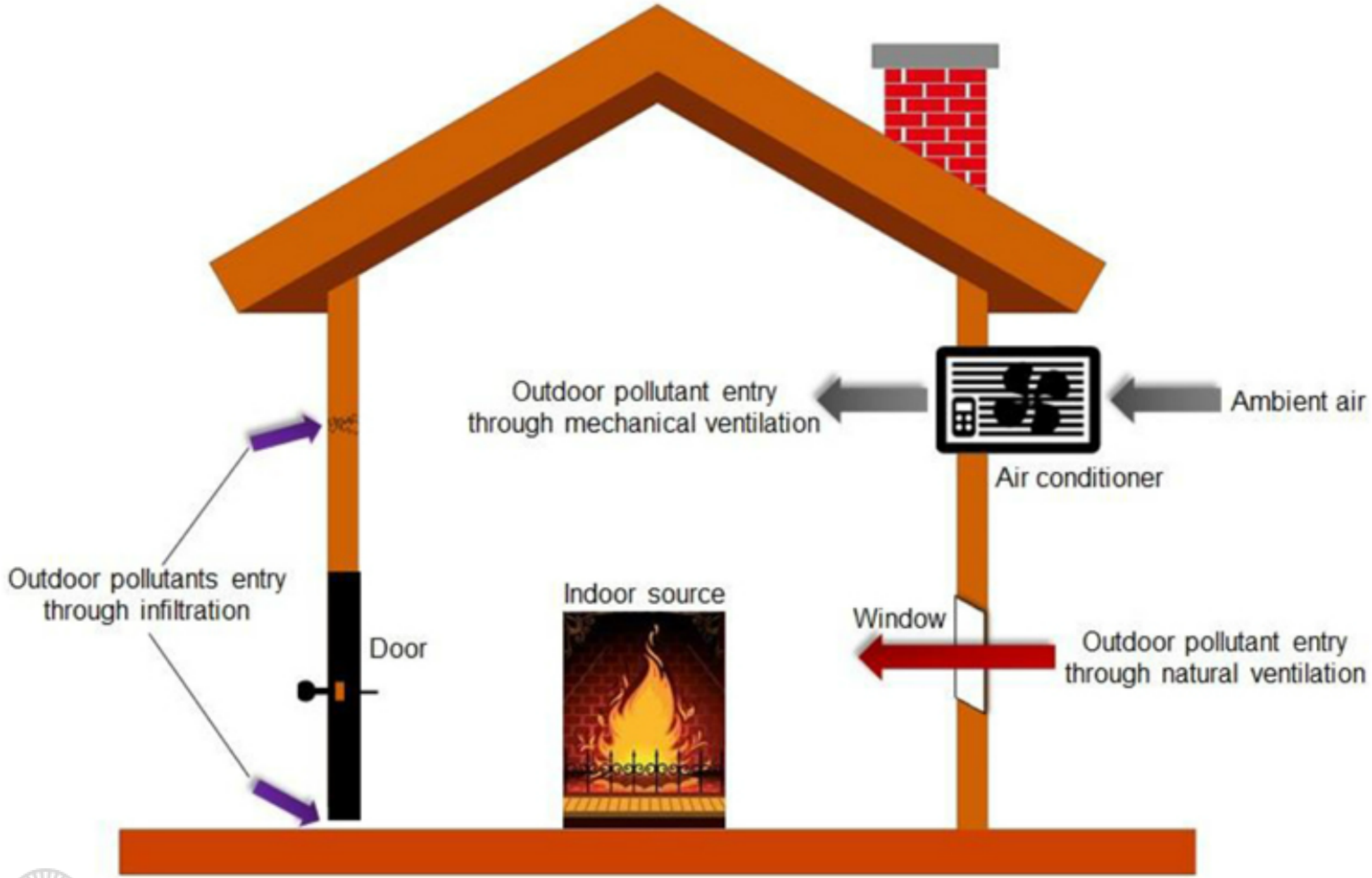
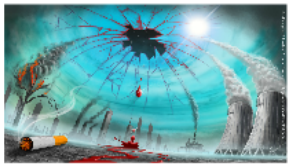

Outdoor pollutant entry
through mechanical ventilation
Ambient air
Air conditioner
Outdoor pollutants entry
through infiltration
Door
Indoor source
Window
Outdoor pollutant entry
through natural ventilation

Conclusion Recommendations:



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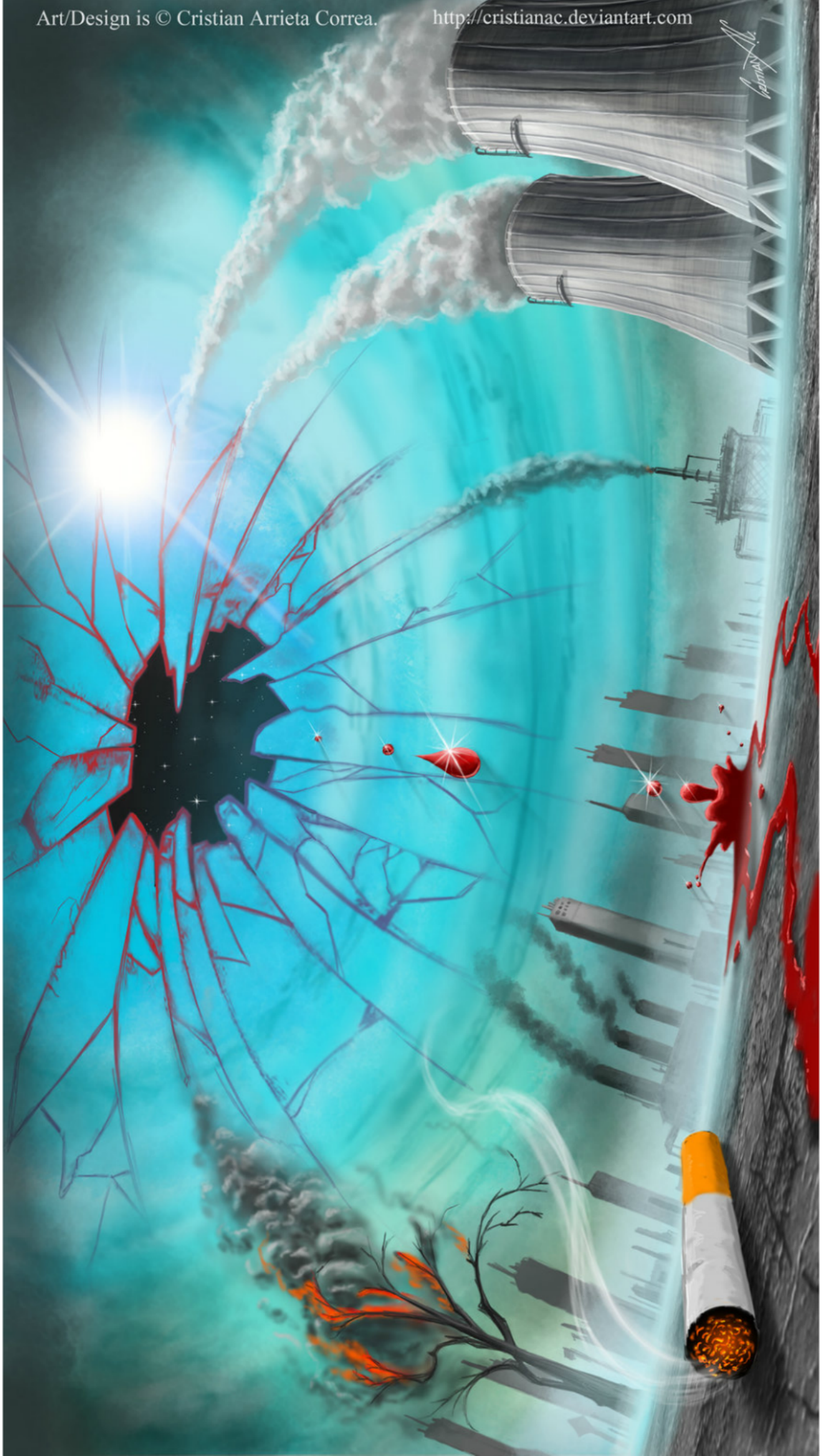
Art/Design is © Cristian Arrieta Correa.
http://cristianac.deviantart.com

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To be an environmental engineer you must be positive leader.

- If we gave up, other creatures will give up.


Prezi

عَلَى هَذِهِ ٱلْأَرْضِ

مَا يَسْتَحِقُّ ٱلْحَيَاةَ

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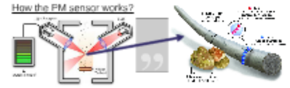

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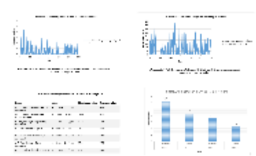

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