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JKGT Green Building Services

Net Zero Solutions

Er Bashir A. Dar (Electrical Eng), JK Green Technologies
Er Suhail A. Qadir (Computer Eng), JK Green Technologies
Er BVN Satyanarayana (Mechanical Eng), Pavani Engineers

Agenda

1. GRIHA V-2019 & ECBC-2017 Framework
2. Mechanical HRV for Net Zero Building
3. Indoor Air Quality Monitoring
4. Central Hot Water (CHW) & Heating
5. JKGT Other Solutions
6. Action Plan

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GRIHA V-2019 & ECBC-2017
Green Building Framework

Green Buildings- Time to Act is – Now !

- India has pledged to be a **Net Zero Emission** nation by the year 2070 in COP 26.
- Building and home emissions contribute significantly to global pollution and greenhouse gas (GHG) emissions.
- Heating, Cooling, and Electricity account for about 30% of global energy consumption and 28% of global CO_2 emissions. [International Energy Agency, IEA]
- In Jammu and Kashmir, the temperature is rising at a higher rate in comparison to the world average. The temperature of the region **has increased by 1.2 degree** Celsius over the last century, higher than the global average of 0.8 to 0.9 degree Celsius. [Kashmir Reader]

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Dry spell in tributaries of Jhelum in Anantnag district of Kashmir

Crevasse in a glacier in Sonmarg, Kashmir.

GHG Mitigation Strategies

The UN has defined sustainable development as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
To reduce building and home emissions, key strategies include:

- **Energy Efficiency**: Improving insulation, using energy-efficient appliances, and adopting smart home technologies and ECBC 2017
- **Renewable Energy**: Switching to solar, and other renewable energy sources for electricity and heating.
- **Sustainable Materials**: Using low-carbon construction materials and recycling waste.
- **Green Building Standards**: Certifications like GRIHA –Green rating for Integrated Habitat Assessment that promote sustainable building practices.

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JKGT Passive Building Solutions – Sustainability Framework

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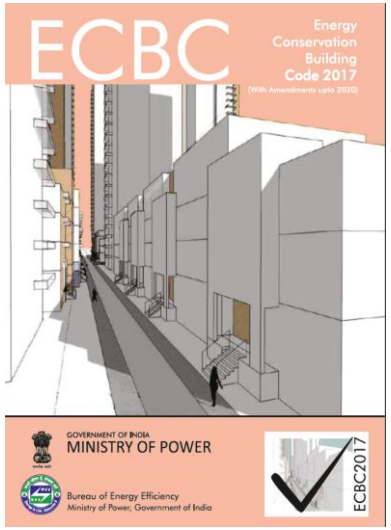
ECBC 2017 Energy Conservation Building Codes (ECBC)
Minimum energy efficiency standards. Applicable to large commercial buildings (connected load of 100 kW/contract demand of 120 kVA and above) Same Principals and technologies can benefit Homes

GRIHA VERSION 2019 MANUAL (VOLUME I)
GRIHA –Green rating for Integrated Habitat Assessment independent platform for the interaction on scientific and administrative issues related to sustainable habitats in the Indian subcontinent. Founded by TERI (The Energy and Resources Institute, New Delhi) with support from MNRE (Ministry of New and Renewable Energy, Government of India)-

SVAGRIHA V.3 Abridged Manual
SVAGRIHA, an abbreviation for Simple Versatile Affordable small offices/ houses 100 m2 ≤ x ≤ 2500 m2

JKGT must develop consultants in these **Mr Bashir A Dar** to develop GRIHA expertise and Mr Suhail Qadir to develop **ECBC 2017** expertise. All team to have good understanding of this framework.



ECBC 2017: An Integrated Process

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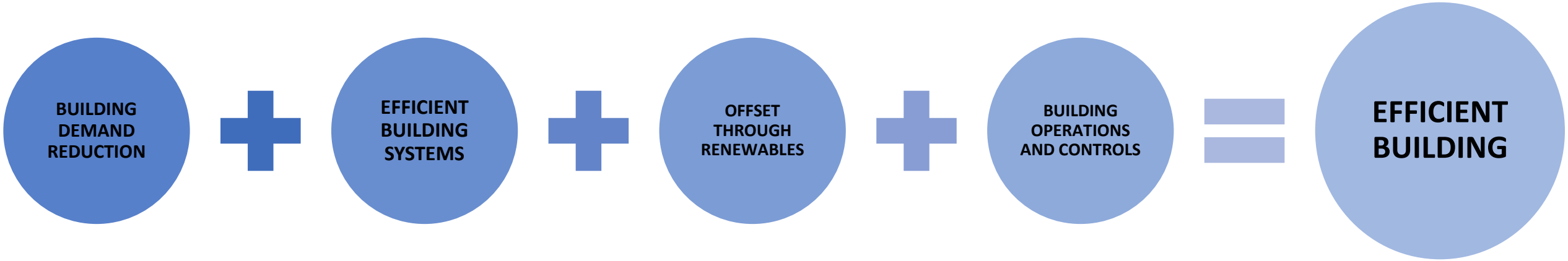

ENVELOPE

- Insulation of roof & walls
- Shading windows
- Glass selection (SHGC, u-value, VLT)
- Effective daylight in the building

LIGHTING

- REDUCED ARTIFICIAL LIGHTING REQUIREMENT (due to daylight enhancement)
- Low lighting power density of the lighting system
- CONTROLS: daylight, occupancy, motion controls, astronomical controls for exterior

HVAC

- System sizing reduced compared to conventional
- **Efficient systems**
- System controls
- System balancing

ELECTRICAL

- Efficient equipment, motors
- Power factor correction
- Transformers, dg sets
- Distribution system

SERVICE WATER HEATING & RENEWABLE

- Offset electricity use for hot water requirement of building
- Offset electricity form grid by power generation through renewable

GRIHA V2019 Building Certification Criterion

GRIHA V 2019 follows these 11 Criterion, key are:

- Project demonstrates compliance with the mandatory requirements of **ECBC 2017**
- Ensure that the project meets the **SHGC** compliance /weighted façade average SHGC for each orientation.
- Ensure **continuous monitoring of CO, CO2, temperature, and RH levels** such that they meet the permissible thresholds as per ISHRAE standard 10001:2016, for all habitable by installation of sensor(s) deployed with feedback system
- Demonstrate reduction in building water demand from the GRIHA base case
- Provide infrastructure (multi-coloured waste bins/different refuse chutes to store e-waste, biomedical waste, organic waste, plastic waste, paper waste, and other inorganic solid waste) for building occupants to ensure segregation of waste at the source.

GRIHA Towards Net Zero Houses

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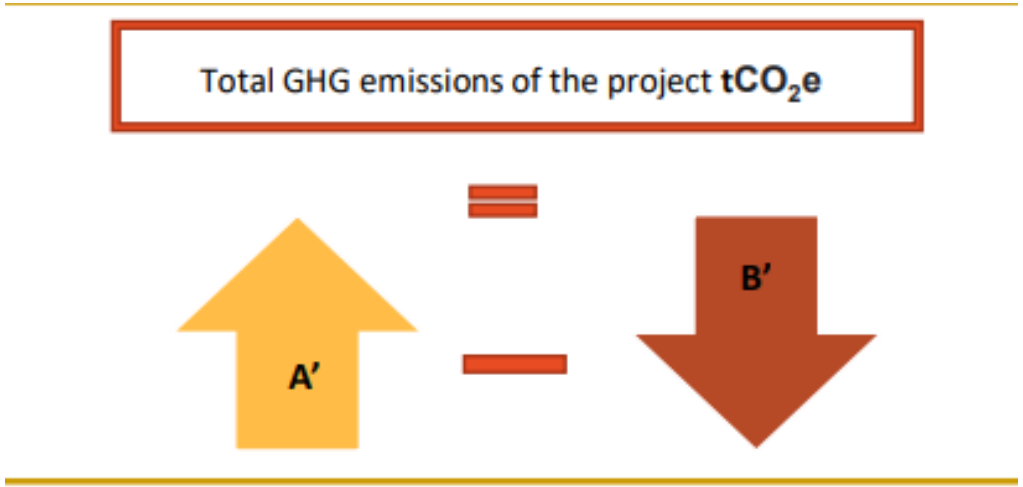
The carbon metric is a measure (a partial carbon footprint) that is based on energy consumption/ demand data and related building information for an existing building in operation. It provides information related to the calculation of GHG emissions and can be used as an environmental indicator.

To calculate the direct CO2 emissions, the energy consumption can be translated to CO2 emissions figures by using conversion factors (emission factors) for different energy forms.

- E1 = E2 + E3 where E1 is total energy,
- E2= renewable
- E3 = non-renewable
- G1 = E1 x conversion factor [Emissions from total energy]
- G2 = E4 x conversion factor [Reduction due renewable energy]

Overall GHG emission G3 = G1 – G2



Certification Level		Scale
Red	high carbon emission	0.2
Orange	moderate carbon emission	0.4
Yellow	low carbon emission	0.6
Green	towards carbon reduction	0.8
Blue	near net zero	0.95
Indigo	net zero	1
Violet	net positive	1+

List of criteria GRIHA - Interior Spaces

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Sections	Criterion Number	Criterion Name	Maximum Points	Section Weightage
Section 1. Energy & Water Efficiency	1	Energy optimization using efficient appliances	4	**16**
	2	Lighting Power Density (LPD) Optimization	3	
	3	Renewable Energy Utilization	4	
	4	Water conservation	5	
	5	Water quality	0	
Section 2A. Low Impact Materials	6	Procurement of materials	7	**17**
	7	Use of contaminant free building materials	6	
	8	Design optimization	4	
Section 2B. Life Cycle Assessment	9	Material & product life cycle assessment	13	**13**
Section 3. Occupant Health & Comfort	10	Thermal comfort	2	**28**
	11	Visual comfort	16	
	12	Acoustic comfort	5	
	13	Indoor air quality	5	
Section 4. Solid Waste Management	14	Segregation and reduction of waste	4	**6**
Section 5. Social & Well-Being	15	Social	5	**10**
	16	Wellbeing	5	
Section 6. Housekeeping & Maintenance	17	Green housekeeping	4	**10**
	18	Operation and maintenance	6	
Section 7. Innovation	19	Innovation	4	**4**

JKGT Passive House - Summary

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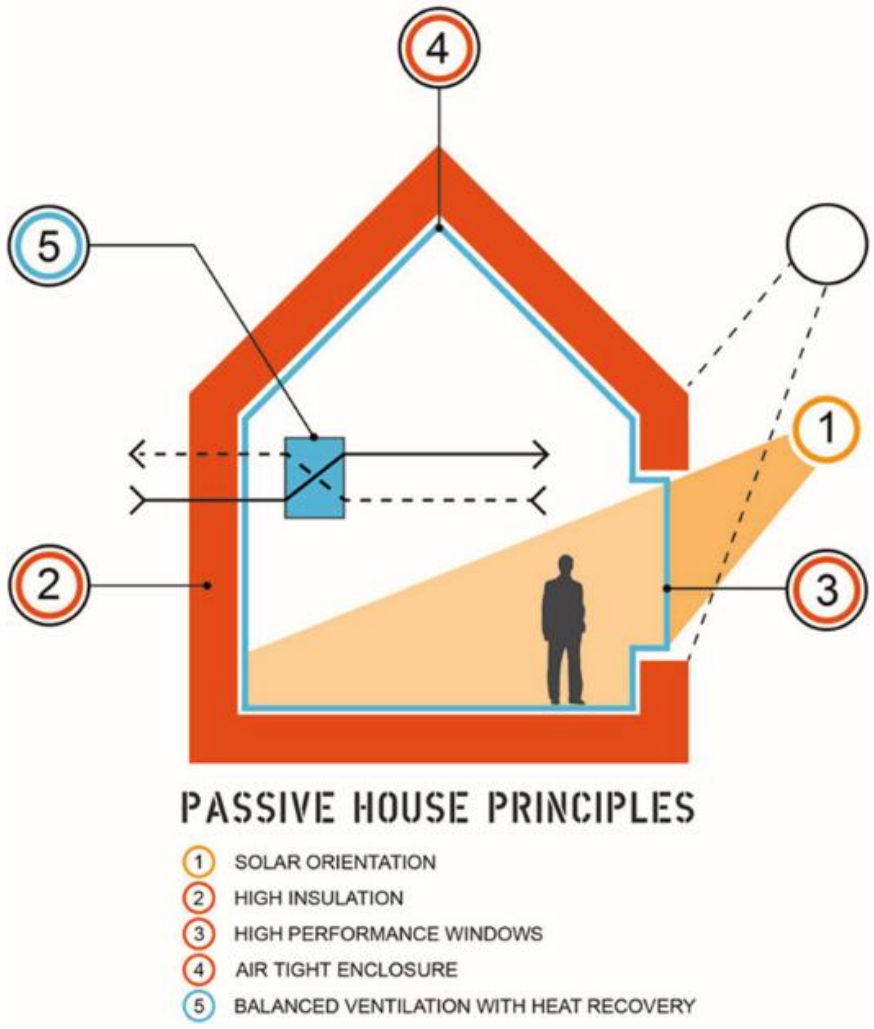
Green houses and buildings are extremely comfortable in all seasons. That's because there are no drafts, temperature variance is extremely narrow and active, balanced ventilation makes for superb indoor air quality. And yes, passive house owners open their doors and windows just as they would in a conventional home.

- It employs **continuous insulation** through its entire envelope without any thermal bridging.
- The **building envelope is extremely airtight**, preventing infiltration of outside air and loss of conditioned air.
- It employs **high-performance windows** (typically triple-paned) and doors.
- It uses some form of **balanced heat and moisture recovery ventilation** and uses a minimal space conditioning system. (optional)
- **Solar gain is managed** to harness the sun's energy for heating purposes and to minimize in cooling seasons minimizing the energy loads that renewables are required to provide.



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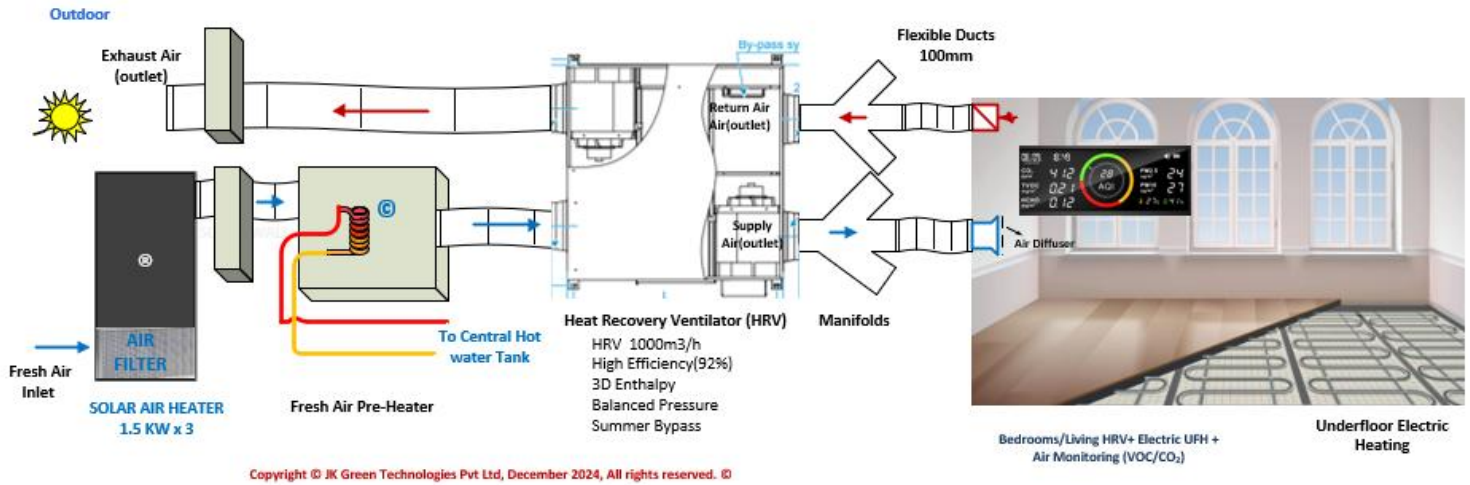
Mechanical HRV

Occupant Health & Comfort in a Green Building

JKGT Mechanical Heat Recovery Ventilation (HRV)



- A Mechanical Heat Recovery Ventilator (MHRV) is a critical component in Passive House green design. It ensures excellent indoor air quality while maintaining energy efficiency by recovering heat from exhaust air and using it to precondition incoming fresh air
- By recovering heat from exhaust air, HRVs reduce the heating load, which is critical for meeting the Passive House standard of **≤ 15 kWh/m²/year** for heating energy.
- HRVs provide a constant supply of fresh, filtered air, reducing humidity, Odors, and pollutants (e.g., CO_2, VOCs) while maintaining a comfortable indoor temperature.
- JKGT Innovative design ensures efficient Solarwall and Heat pump preheating and ventilation, leveraging the heat pump and HRV unit to minimize energy consumption

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Indoor Air Quality Monitoring
Occupant Health & Comfort in a Green Building

Air Quality Index- Know what you breadth

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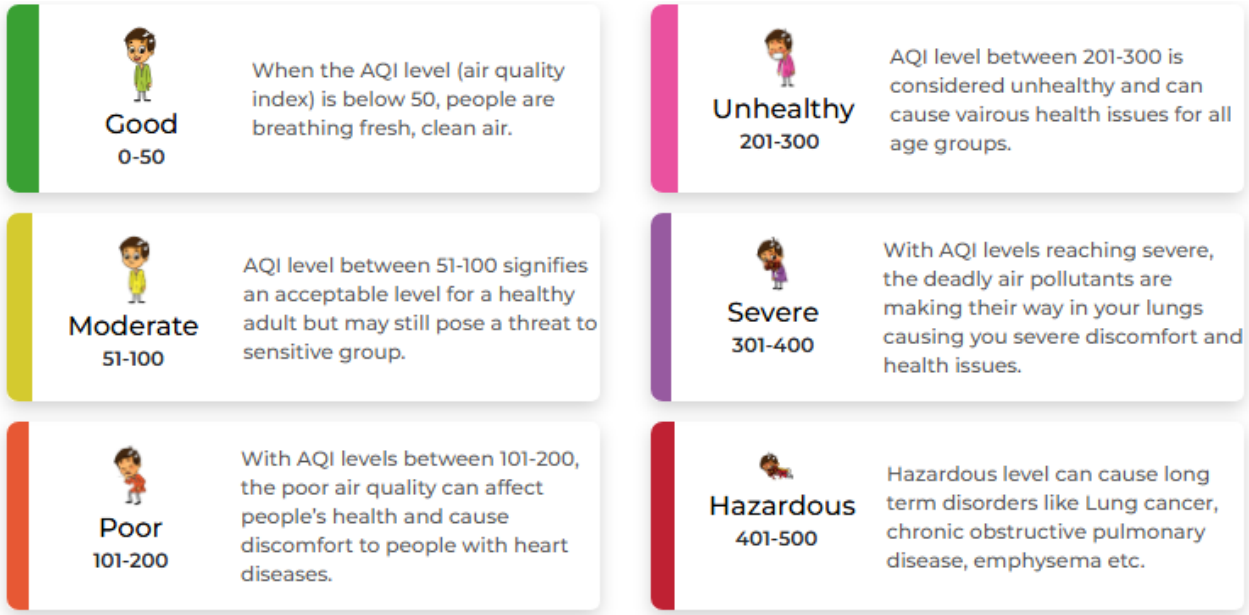
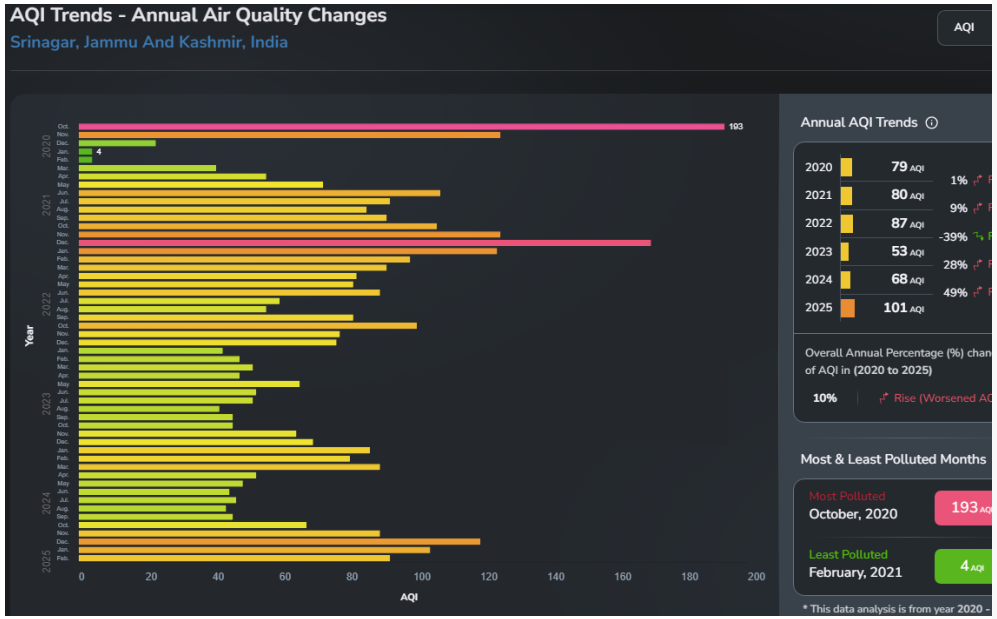
- **Air Quality Index (AQI)** is a tool for effective communication of air quality status to people can easily understand and take action. The AQI is used by agencies to communicate to the public how polluted the air currently is or how polluted it is forecast to become. Public health risks increase as the AQI rises.
- Here are the "Terrible 10" health risks from breathing polluted air:
  - ❑ Premature death:
  - ❑ Asthma attacks:
  - ❑ Cardiovascular disease:
  - ❑ Lung cancer:
  - ❑ Developmental damage:
  - ❑ Susceptibility to infections:
  - ❑ Worsened COPD symptoms: chronic obstructive pulmonary disease

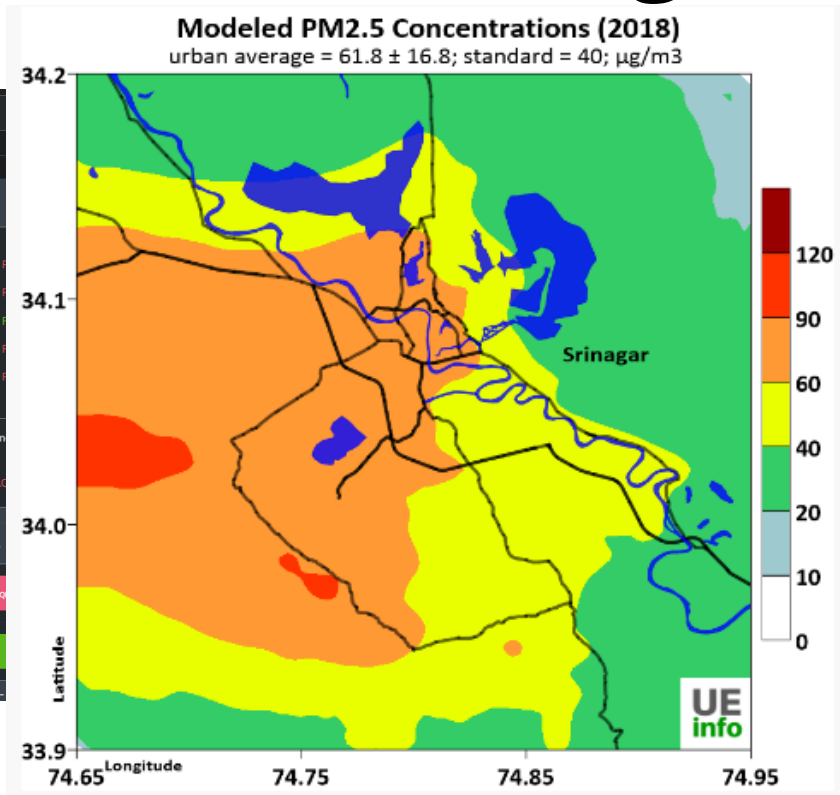
- To see Live AQI in Srinagar see: https://www.jk-greentech.com/

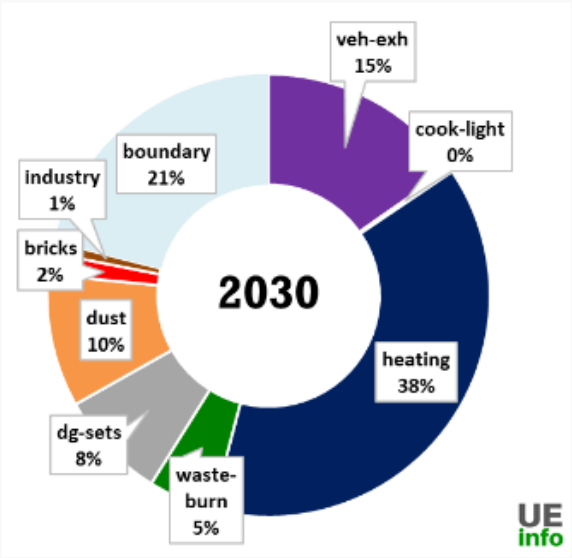
AQI Category (Range)	PM_{10} 24-hr	$PM_{2.5}$ 24-hr	NO_2 24-hr	O_3 8-hr	CO 8-hr (mg/m^3)	SO_2 24-hr	NH_3 24-hr	Pb 24-hr
Good (0-50)	0-50	0-30	0-40	0-50	0-1.0	0-40	0-200	0-0.5
Satisfactory (51-100)	51-100	31-60	41-80	51-100	1.1-2.0	41-80	201-400	0.6 –1.0
Moderate (101-200)	101-250	61-90	81-180	101-168	2.1- 10	81-380	401-800	1.1-2.0
Poor (201-300)	251-350	91-120	181-280	169-208	10.1-17	381-800	801-1200	2.1-3.0
Very poor (301-400)	351-430	121-250	281-400	209-748*	17.1-34	801-1600	1201-1800	3.1-3.5
Severe (401-500)	430 +	250+	400+	748+*	34+	1600+	1800+	3.5+



Air Quality Index- AQI Srinagar







- Kashmir in past 30 hrs has seen increase in (GHS) Roads and rail lines, commercial activities (such as hotels, hospitals, kiosks, restaurants, malls, cinema complexes, traffic intersections, worship points, industrial hubs, and telecom towers), increase in population density has resulted in high AQI which has breached the limits **(PM 2.5) since 2016**.
- https://www.aqi.in/dashboard/india/jammu-and-kashmir/srinagar

Indoor Air Quality (IAQ)

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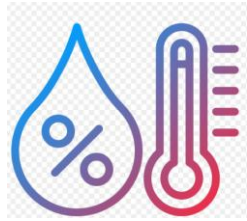
- Air pollution is a major environmental risk to health. By reducing air pollution levels, countries can reduce the burden of disease from stroke, heart disease, lung cancer, and both chronic and acute respiratory diseases, including asthma.
- We spend about 90% of our time indoors !
- Moreover, everyday activities — like cooking, cleaning, lighting candles and playing with pets — release additional air pollutants into the home.
- Occupant health and safety are paramount in the current environment and sensors that detect harmful compounds can serve as front line of defence.

IAQ Index			
PM2.5	**VOC**	**CO2**	
$\mu g/m^3$	$\mu g/m^3$	ppm	Hazard Level
<12	100	700	**Good**
35	200	800	**Moderate**
56	300	1100	**Poor**
150	400	1500	**Unhealthy**
250	500	2000	**Very Unhealthy**
300	600	3000	**Hazardous**
500	700	5000	**Extreme**

Indoor Air Quality- Temperature/Humidity

- Indoor air quality is one of the most integral components of wellness, at home and at the workplace.
- Indoor Air Quality impacts everyone, including those who may be more vulnerable - children, the elderly, and people with health conditions like asthma and heart disease.
- The ASHRAE guidelines recommend **20 C to 23 C** in the winter and **22 C to 27 C** in the summer.

- The ASHRAE guidelines recommend a relative humidity (RH) of **30 to 60 percent**. While lower humidity may discourage pests, mold and bacterial growth, higher humidity causes virus particles to decay faster leading to reduced risk of infection.



Indoor Air Quality- CO2

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- Carbon Dioxide (CO2): is a colourless, odourless, non-flammable gas that naturally occurs in the atmosphere.
- CO2 is produced by body metabolism and is a normal component of exhaled breath. It also results from the burning of fossil fuels and natural sources such as volcanic eruptions. CO2 levels in outdoor air typically range from **300 to 400 ppm** but can be as high as **600-900** ppm in metropolitan areas.
- Occupants may experience health effects in buildings where CO2 is elevated. Decreased performance in school or office settings (e.g., decision-making, task performance, standardized test scores)
- At high levels, the carbon dioxide itself can cause headache, dizziness, nausea and other symptoms. This could occur when exposed to levels above **5,000 ppm** for many hours.
- At even higher levels of CO2 can cause asphyxiation as it replaces oxygen in the blood-exposure to concentrations around **40,000 ppm** is immediately dangerous to life and health.

CO_2 [ppm]	Air Quality
2100	BAD Heavily contaminated indoor air Ventilation required
2000	
1900	
1800	
1700	
1600	
1500	MEDIOCRE Contaminated indoor air Ventilation recommended
1400	
1300	
1200	
1100	
1000	FAIR
900	
800	GOOD
700	
600	EXCELLENT
500	
400	

Indoor Air Quality- PM2.5/PM10

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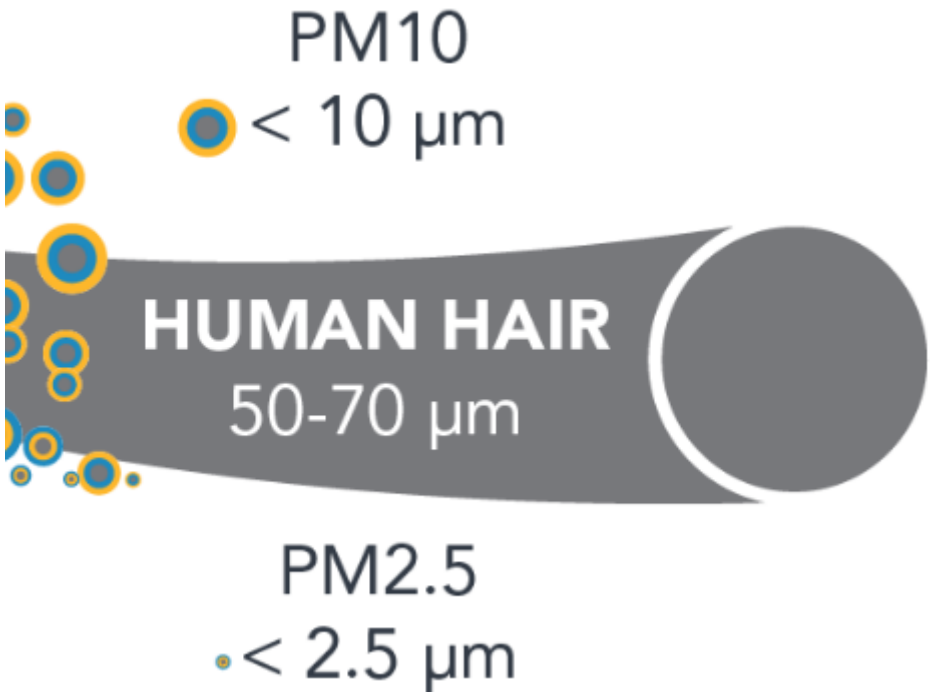
- **Particulates (PM2.5/PM10):** Those with a diameter of 10 microns or less (PM10) are inhalable into the lungs and can induce adverse health effects. Fine particulate matter is defined as particles that are 2.5 microns or less in diameter (PM2.5).
- Airborne particulate matter, often caused by smoke and vehicle exhaust, are tiny solid or aerosol particles that can be inhaled and have harmful health effects.
- Exposure to inhalable particles can affect both your lungs and your heart. Small particles (less than 10 micrometers in diameter) can get deep into your lungs, and some may even get into your bloodstream.
- People with heart or lung diseases such as coronary artery disease, congestive heart failure, and asthma or chronic obstructive pulmonary disease (COPD), children and older adults may be at greater risk from PM exposure.
- A number of adverse health impacts have been associated with exposure to both PM2.5 and PM10. For PM2.5, short-term exposures (up to 24-hours duration) have been associated with premature mortality, increased hospital admissions for heart or lung causes, acute and chronic bronchitis, asthma attacks, emergency room visits, respiratory symptoms, nose, throat and lung irritation, coughing, sneezing, runny nose and shortness of breath



Indoor Air Quality- TVOC

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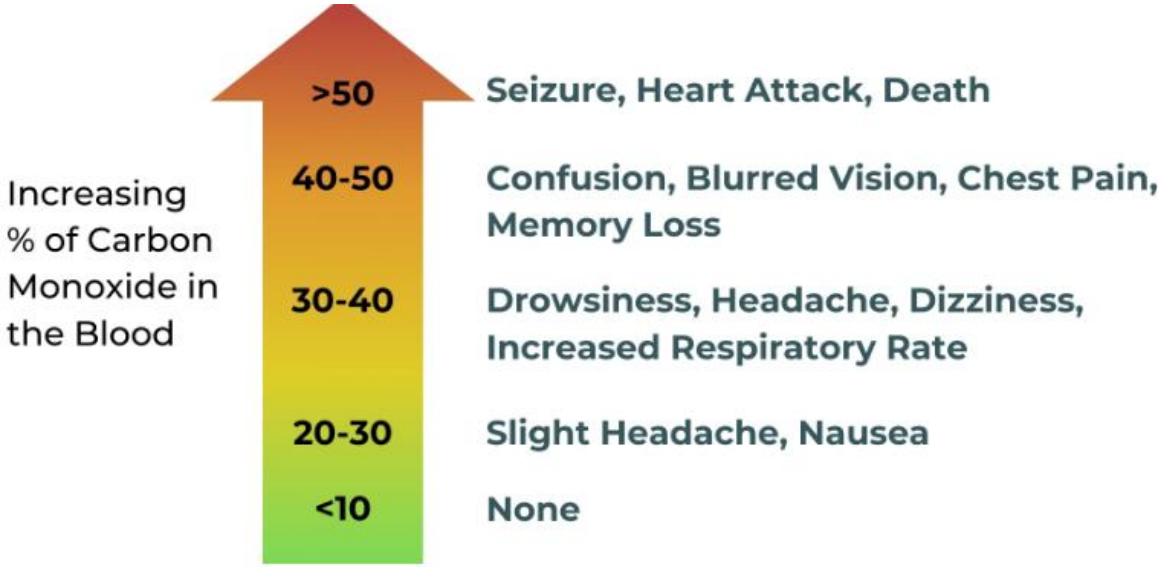
- Chemicals (TVOC): Volatile Organic Compounds (VOCs) are a large group of chemicals that are found in many products we use to build and maintain our homes.
- Once these chemicals are in our homes, they are released or “off-gas” into the indoor air we breathe. They may or may not be able to be smelled, and smelling is not a good indicator of health risk.
- Common examples of VOCs that may be present in our daily lives are: benzene, ethylene glycol, formaldehyde, methylene chloride, tetrachloroethylene, toluene, and xylene.
- In most guidelines, a concentration of less than 0.5 mg/m3 is deemed acceptable, along with a stipulation that any specific compound being tracked should not exceed 250 ug/m3. some VOCs are quite harmful, while others pose less of a threat. In general, some symptoms to look out for are:
  - Eye, nose, and throat irritation
  - Headaches and nausea
  - Loss of coordination/Fatigue/Dizziness
  - Allergic skin reactions

Index Category	Index Value	TVOC (ppb)
Good	0 - 50	0 - 220
Moderate	51 - 100	221 - 660
High	101 - 150	661 - 1430
Very High	151 - 200	1431 - 2200
Very High	201 - 300	2201 - 3300
Very High	301 - 500	3301 - 5500

Indoor Air Quality- CO

- Environmental and occupational exposure to carbon monoxide (CO) can lead to poisoning deaths.
- Carbon Monoxide (CO): is an odorless, colorless gas that is a by-product of the incomplete burning of fuels containing carbon such as wood, gas and oil.
- Sources include heating appliances such as kerosene and gas space heaters; leaking chimneys and furnaces; back-drafting from furnaces, gas water heaters, wood stoves, and fireplaces.
- At low concentrations, fatigue in healthy people and chest pain in people with heart disease.
- At higher concentrations, impaired vision and coordination; headaches; dizziness; confusion; nausea.
- For indoor settings, the acceptable level of carbon monoxide is stated by WHO which recommends 9-10ppm for no more than 8 hours. 25-35ppm for no more than 1 hour and 90-100 ppm for no more than 15 minutes.



JKGT Indoor Air Monitoring Solutions

Know what you breadth

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HRV Air Quality

- All JKGT HRV solutions have integrated eCO2 and VOC sensors.
- Single chip, integrated with four gas sensing elements, with a fully calibrated air quality output signal
- App available on your Mobile

	State	Actions
nected SSID	iotnet	
Home Version	2024.12.4	
High Speed	OFF	Off On
Low Speed	OFF	Off On
ddress	10.1.100.105	
nal Humidity	NA	
Wifi Address	CC:7B:5C:28:2A:34	
art	OFF	Off On
n Temperature	21.8 °C	
rwall Temperature	22.9 °C	
us	ON	
C	0.0 ppb	
me Human Readable	25s	
me Sensor	25 s	
Safe Mode	OFF	Off On
Signal Sensor	-43 dBm	
2	400.0 ppm	
_status	ON	Off On 0 255

Air quality monitor

- Measures PM1.0, PM2.5, PM10, AQI, Temperature & Humidity
- High quality laser sensors, calibrated individually
- The monitor has a 3.5” touch display. Each parameter is colour coded

Automatic Air Purifiers

- PM2.5 particle, TVOC Gas Sensors
- Automatically filters the invisible viruses, allergens or pollutants in your home, to keep it clean and safe.
- Better air quality helps prevent or alleviate allergies, asthma and respiratory issues

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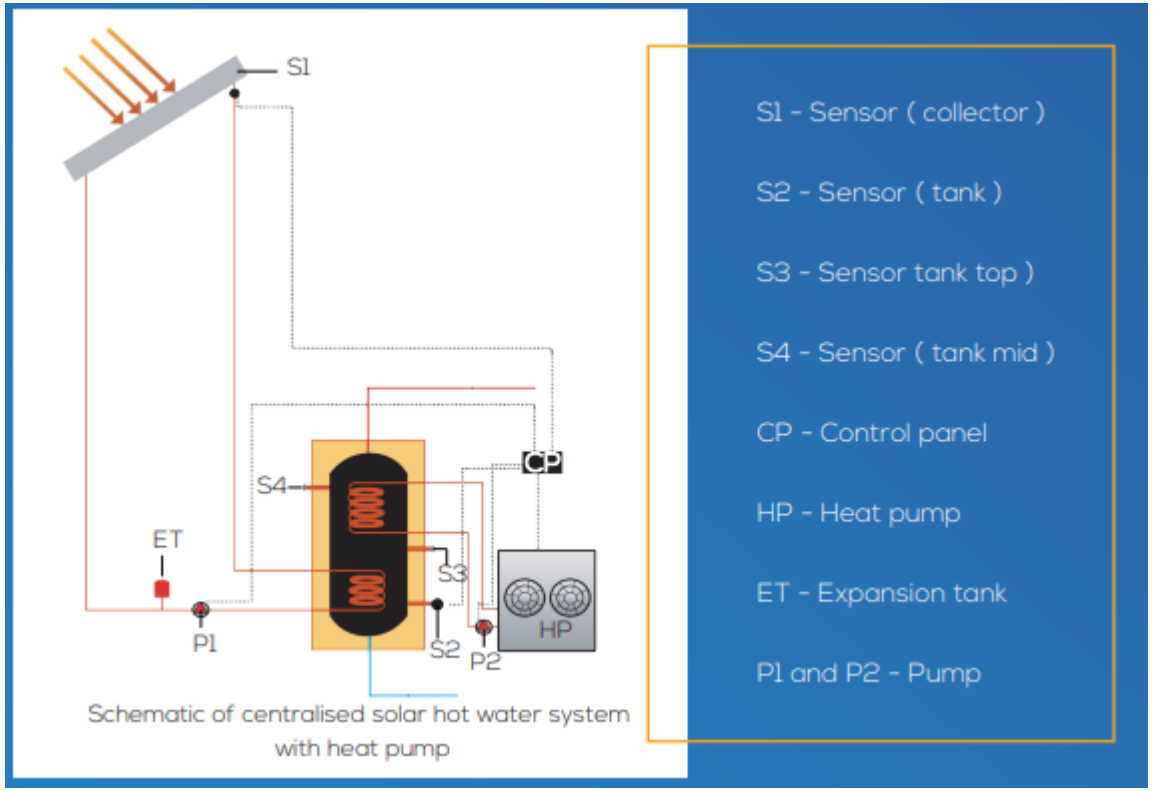
JKGT-Net Zero
Central Hot water & Heating Solution

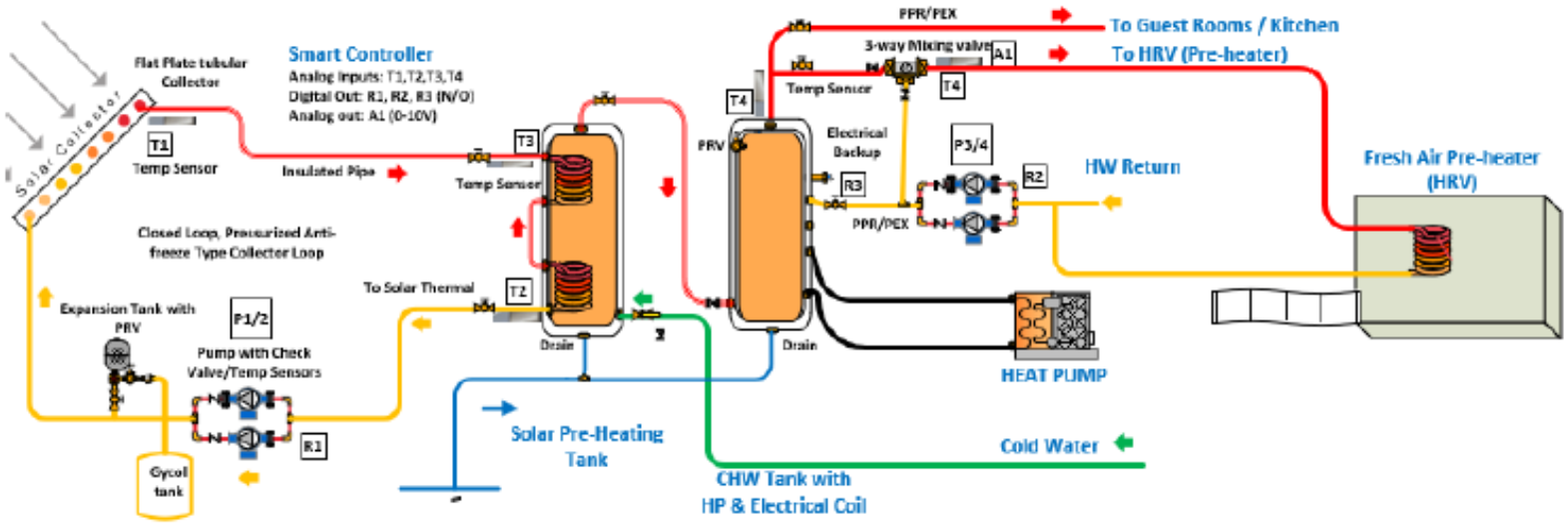
JKGT Innovative CHW & Central Heating Solution

- JKGT Central Hot Water Solution is an innovative and intelligent solar solutions with an idea to implement green energy in most efficient manner.
- The highly efficient circulator heat pump makes hot water available 24 hours a day.
- It is an extensively unconventional system which can be installed anywhere in the house, be it the basement or the store-room by connecting the hot water to many points in the house through an insulated pipeline.
- It can also be connected to a pressure boost pump.
- Lowest cost of Heating resulting in low OPEX cost and high ROI (about 75% less than conventional heating)



Schematic of centralised solar hot water system with heat pump

JKGT CHW & Central Heating Solution



The following are the key components of the system:

- Solar Water Heater – 1000 LPD, Solar Collectors – around 40 m2 collector area
- Solar Pre-Heating Heat exchanger tank
- Heat Pump – 5 KW,
- Smart Controller: P1, P2, P3, P4 – Danfoss Circulation Pumps
- T1, T2, T3, T4 – Temperature sensors
- Expansion tank with Pressure relief Valve
- Three way mixing valve

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JKGT Green Misc.

JKGT Waste Management- Reduce, Reuse and Recycle.

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Segregate at Source. Simply start by getting color coated bins. Differentiate the bins into following:

- Blue: Paper/Plastic
- Green: Organic waste (food waste, plant material)-Biodegradable
- Yellow: Glass
- Grey: Metal
- Black: Non-recyclable waste
- Red: Hazardous waste (chemicals, batteries, medical waste)

Waste which can be decomposed by biological processes is known as “Biodegradable waste”. Organic waste is biodegradable and recyclable.