Episode 56GX August 6, 2023. Hyper-localized PM2.5 level modeling for cities without enough actual monitors.

From "The Week August 11, 2023 edition" www.theweek.com print version page numbers given.

"Europe: The demise of the summer beach holiday" page 14.

On the island of Corfu, Greece 2,500 tourists were forced to flee a line of orange flames on the horizon. Planes and helicopters dumped seawater into the forests. The German Health Minister had an overheated vacation in Italy where July temperatures were well over 100 degrees. The news all summer has been of tourists being airlifted off Italian beaches or rushed by ambulance to Greek hospitals. Finland and Lithuania are being looked to as alternative vacation destinations. "Noted" page 16

If a Republican is elected president in 2024 conservative groups will hand him or her a detailed "battle plan" to end the federal government's efforts to promote solar and wind energy, reduce emissions, and slow climate change. "Project 2025" would gut federal regulatory agencies and promote expansion of oil and gas. This information in The Week was taken from Politico.

"Global Boiling" page 17

Heat stroke can cause organ failure within minutes, straining heart, lungs and kidneys. Loss of labor due to heat exposure cost the economy $100 billion in 2020. That figure is predicted to hit $500 billion annually by 2050.

"Is the Gulf Stream about to stop flowing?" page 22

The Gulf Stream could stall out any time between now and the 2090s. That would send North American and European temperatures plunging, further heating the tropics and disrupting the monsoon rains that billions of people depend on for food in Asia, Africa and South America.

"Hiking in the summer heat" page 32

Choose shaded trails and get started before or near sunrise. Pack more water than you think you need, a liter per hour plus salty snacks like trail mix. If you feel hot, quit early.

California

Dennis Mattinson's Weekend Weather - August 4 - 6, 2023 - Sierra Wave

Sierra Wave

He specialized in the monitoring, measurement and movement of particulate matter 2.5 and 10 microns in size (known as PM-2.5 and PM-10)

California, Los Angeles

How to Protect Yourself From Wildfire Smoke - EcoWatch

EcoWatch

During the wildfire season, the measurement called PM 2.5 (which stands for particulate matter) is especially important. This number indicates the ...

California, San Francisco

Fires Hurt the Poor More - CounterPunch.org

Counterpunch

... across the Bay Bridge from the San Francisco side at around 9 PM and met the warm, slightly acrid smell of wood smoke about halfway over.

Colorado, Pagosa Springs

Dry Lake Fire update | The Pagosa Springs SUN

The Pagosa Springs SUN

The Dry Lake fire is burning within a tract of land that was treated by a ...

https://www.colorado.gov/pacific/cdphe/wood-smoke-and-health.

Indiana, Bloomington

EcoReport – August 4, 2023 - WFHB

WFHB

Of those 25 total alerts, 14 were issued because of ozone pollution, and 10 were issued because of particle pollution from fine particles, or PM 2.5 ...

Michigan, Alpena

Structure Fire at Speedy Blaze in Alpena Thursday - WBKB-TV

WBKB-TV

The wood product manufacturing building is located at 307 South 3rd avenue. The Alpena City Fire Department responded to reports of smoke coming ...

Michigan, Alpena

[Officials: Wood products close to heat sparked Sable Street fire - The Alpena News](#)

The Alpena News

News Photo by Steve Schulwitz Firefighters from the Alpena Fire Department prepare to enter a burning building on Sable Street on Thursday. The fire ...

Michigan, Alpena

[Alpena Speedy Blaze Suffers Smoke Damage Following Fire - NEWSnet - News... as it used to be](#)

NEWSnet

An Alpena firewood company suffered smoke damage on Thursday after one of their wood crates caught fire. The Alpena City Fire Department was ...

New York

[You checked the air quality index. But where is that air? - Times Union](#)

Times Union

Wildfire smoke is the highly visible concern of summer 2023, but KAQI was actually launched to study PM 2.5 air pollution from wood burning within ...

Texas, Jim Wells County

[Duval, Jim Wells County issue burn bans - Alice Echo News Journal](#)

Alice Echo News Journal

During a burn ban, individuals are prohibited from burning electrical insulation, treated lumber, plastics, non-wood construction/demolition ...

Washington

[What WA's new wildfire smoke rules might mean for outdoor workers - InvestigateWest](#)

InvestigateWest

Canada, British Columbia, Okanagan Valley

[Thick smoke sinks into Okanagan; air quality ranked among worst in the world | Globalnews.ca](#)

Global News

Thick wildfire smoke has seeped into the Okanagan Valley, ... "Since 2017, we have been seeing much more, higher concentrations of wood smoke for ...

India

[Rising air pollution shows urgent need for localized climate action in the Northeast](#)

Hindustan Times

This data is primarily based on monitoring of PM 2.5, the prominent pollutant which is a fine particulate matter that poses serious health risks ...

India

[In joint meet, Rai appeals for reduction in stubble burning - Millennium Post](#)

Millennium Post

The minister also praised the effectiveness of the Winter Action Plan, stating that Delhi witnessed a steady decline in PM 10 and PM 2.5 levels

India, Delhi

[Delhi minister calls for reduction in stubble burning - Social News XYZ](#)

Social News XYZ

... implemented by the Kejriwal government during the winter season, Delhi has registered a steady decline in the presence of PM 10 and PM 2.5.

[Delhi Minister Urges Reduction of Stubble Burning to Curb Pollution | Weather.com](#)

weather.com

... Plan's implementation by the Kejriwal government during winter, Delhi has experienced a consistent reduction in PM 10 and PM 2.5 levels.

India, Mumbai

[You checked the air quality index. But where is that air? - Times Union](#)

Times Union

Wildfire smoke is the highly visible concern of summer 2023, but KAQI was actually launched to study PM 2.5 air pollution from wood burning within ...

Pakistan

[Cutting, burning threaten ancient Pakistani forest - YouTube](#)

YouTube

Various of burned trees 11. SOUNDBITE (Urdu) Khayal Muhammad Dumer, Ziarat resident: "In the winter, trucks filled with juniper tree wood ...

PM2.5 and Human Health

[Prenatal exposure to environmental air pollution and psychosocial stress jointly contribute ... - Nature](#)

Nature

Antenatal exposures to maternal stress and to particulate matter with an aerodynamic diameter of less than 2.5 μm (PM2.5) have been independently ...

PM2.5 and Human Health

[Outdoor air pollution may increase non-lung cancer risk in older adults - Medical Xpress](#)

Medical Xpress

Chronic exposure to fine particulate air pollutants (PM2.5) and nitrogen dioxide (NO2) may increase non-lung cancer risk in older adults, ...

PM2.5 and Technology

[Vortex achieves MCERTS Certification for VTX Air Monitors - AirQualityNews](#)

AirQualityNews

Vortex's MCERTS-certified PM 2.5 air monitors enable local authorities, environmental agencies, and other stakeholders to proactively address air ...

RAWSEP View: This Nature article about a scientific paper called "Hyperlocal environmental data with a mobile platform in urban environments" uses existing data to predict particulate levels for areas that are not covered by actual PM2.5 monitors in enough areas to collect meaningful amounts of data. This scientific paper also reiterates the problem of high humidity in skewing data collection with laser monitors. This article speaks of the need for hyperlocal environmental data collection that includes particulate monitoring,

[Hyperlocal environmental data with a mobile platform in urban environments - Nature](#)

Nature

NYCCAS runs fifteen monitoring sites in the Bronx, collecting hourly PM2.5, black carbon, NO, and NO2 concentrations once per season.

a Descriptor

[Open Access](#)

[Published: 05 August 2023](#)

Hyperlocal environmental data with a mobile platform in urban environments

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Access to hyperlocal environmental data sources is limited due to the ==lack of monitoring infrastructure==, consistent data quality, and data availability to the public. This paper reports environmental data (==PM==, and relative humidity) collected from 2020 to 2022 in three cities. Each data collection campaign targeted a specific urban environmental problem related to air quality, such as community exposure disparities. Firstly, we introduce the mobile platform design and its deployment in Boston (US), NYC (US), and Beirut (Lebanon). Secondly, we present the data cleaning and validation process, for the air quality data. Lastly, we explain how hyperlocal environmental datasets can be used standalone. We aim to address data scarcity in developing regions and support evidence-based environmental policymaking. Measurement: Particulate Matter. Technology: Low-cost environmental sensing (City Scanner).

Hyperlocal environmental data are desirable for academics and practitioners to identify exposure hotspots, and support evidence-based climate change mitigation. Mobile monitoring complements stationary monitoring.

Studies were conducted with Google Street View cars in Houston, the San Francisco Bay Area, Amsterdam, Copenhagen, and London (https://www.google.com/earth/outreach/special-projects/air-quality). Reference and research-grade air monitors were carried around in cities, repetitively measuring most street segments from months to years. Their raw data were partially published via a third-party online database and API (https://explore.openaq.org).

Air quality datasets in this study were collected using our City Scanner (CS) mobile sensing platform, using existing urban fleets, such as taxis, buses, and municipal service vehicles, as sensing nodes. We present three concepts summarized in Figure 1: low-cost design, modular sensing units, and Internet-of-Things (IoT) capabilities. Our low-cost design follows the definition of a low-cost air sensor by the US Environmental Protection Agency (EPA), which sets an ==upper-cost limit of $2,500== (https://www.epa.gov/air-sensor-toolbox/how-use-air-sensors-air-sensor-guidebook). CS is IoT-enabled, where collected air quality data and device status can be instantly streamed to the cloud for storage and analysis via a cellular network.

Fig. 1

Full size image

Figure 2 illustrates the basic configuration of the current CS iteration, named "Whiteburn II", focusing on the sensing compartment in the front view.

Fig. 2

Whiteburn II basic configuration.

Full size image

In the standard configuration of the sensing compartment, ==a low-cost Alphasense OPC-N3 optical particle counter is adopted for particulate matter== (PM) concentration measurement. It counts the number of particles by emitting a laser beam through the air flow being drawn in, so that by counting the pulses of light scattered by particles in the airflow, OPC can infer the number of particles of different sizes. This technique has been widely adopted in academic and citizen science projects. The platform is also equipped with basic environmental sensing capabilities, including ambient air temperature and relative humidity sensing.

Table 1 Environmental sensor specifications.

Full size table

Data collection campaigns

We used the CS platform version "Whiteburn II" for high spatio-temporal resolution data collection, which is designed as a plug-and-play environmental sensing platform.

Table 2 Deployments in three cities.

In New York City we targeted the Bronx borough, with 2 million residents, mostly ethnic and racial minorities. The Bronx is disproportionately exposed to air quality hazards, as are many other vulnerable neighborhoods which are overburdened with environmental issues. The region is covered by four reference stations operated by the New York State Department of Environmental Conservation, and all mesure PM. The New York City Department of Health designed New York City Community Air Survey (NYCCAS) with a finer air monitoring network of high-quality but not reference-grade sensors since 2008 (https://www.nyc.gov/site/doh/data/data-sets/air-quality-nyc-community-air-survey). NYCCAS runs fifteen monitoring sites in the Bronx, collecting hourly PM2.5.

In Boston we collected hyperlocal air quality data in a neighborhood north of the Boston Logan International airport. We mounted CS units on a research-grade mobile environmental laboratory, which measures real-time particulate matter, whose validity has been proved in previous publications. We contrasted CS-collected data with high-quality mobile laboratory data, demonstrating the transferability of our mobile air quality sampling approach.

The final deployment is our collaborators at American University Beirut, Lebanon which runs the only research-grade air monitoring site, measuring PM. The extremely sparse air monitoring network cannot provide much useful information to

tackle the deteriorating local air quality problem. In this case, our deployment aims to address the local air quality data gap.

Technical Validation

Low-cost sensors are prone to data quality and stability issues. For example, low-cost OPC cannot discern particulate matter from water droplets. Thus, it does not function well in high-humidity environments (85%)[19],[20]. Therefore, it is necessary to perform sensor collocation and calibration to ensure accurate and robust measurements. Here we define collocation as the process of deploying low-cost sensors side-by-side with reference monitors and calibration as the adjustment of raw sensor readings using collocation data and mathematical models. Air quality datasets published in this study were cleaned, calibrated, and validated under a standardized framework referencing the US EPA air sensor performance testing protocols published in 2021. US EPA is a federal agency that regulates and manages environmental protection matters. They also provide references, guidelines, and regulations considered "the gold standard" for air quality monitoring, primarily in the US and many other countries. A general flow chart of our post-processing and validation process is presented in Fig. 3.

Fig. 3

Data post-processing and validation protocols.

[Full size image](#)

Our data cleaning process is straightforward, following the principle to preserve as many data points as possible. First, all sensors are functioning, yielding numerical results. CS is designed to give out "Not Applicable (NA)" signals when sensors operate with anomalies, such low battery or over-heating. Second, readings under high humidity (>90% or raining) are excluded, given that the low-cost particle counter we used is known to have skewed responses in this condition. Lastly, we eliminate records with readings out of the reasonable ranges (<1 ug/m3 or >1000 ug/m3 for PM2.5,).Aabout 15% of raw data are excluded in data cleaning.

PM2.5 calibration models' performance for all cities is presented in Table 3. the calibration model performs poorly on the Beirut dataset, which is caused by Beirut's limited air monitoring resources. Beirut does not have enough resources to operate reference air quality monitoring station due to an economic collapse nor stand-alone reference-grade air instruments that we can access. Alternatively, we used a research-grade PM sensor for collocation and calibration, namely a Met One E-BAM Portable Environmental Beta-Attenuation Mass Monitor.

Table 3 PM2.5 calibration model performance against reference or research-grade monitors.

[Full size table](#)

Data records from all devices for the same environmental indicator (e.g., PM1, PM2.5, PM10,) in each deployment are pooled in the same dataset. Each data file incorporates five categories of fields: unique sensor IDs, time stamp, GPS coordinates, weather, and calibrated concentrations, as demonstrated in Table 4.

Table 4 Data fields' definitions and units. Note that not all fields are present in all datasets.

[Full size table](#)

Fig. 4

Spatial distributions of PM2.5 concentrations in (a) New York Pilot 1, (b) New York Pilot 2, (c) Boston, and (d) Beirut. While covering a large area with high spatial resolution, mobile monitoring is subject to higher uncertainty than stationary monitoring, as the sensor only captures a snapshot of a certain location. Therefore, it is crucial to have repetitive measurements over the same location. In the Bronx, New York City we observe that highways and industrial areas in the bottom right corner suffer from significantly higher PM2.5 concentrations.

Fig. 5

Measured PM2.5 concentrations in the Bronx after calibration and aggregation.

Another common usage for mobile air quality data is land use regression (LUR), to explain and estimate air pollution levels in places without measurement. Using the measured PM2.5 concentrations in each grid cell, which align with the regulatory air pollution maps developed under the New York City Community Air Survey (NYCCAS) program and are retrieved from New York's open data platform (https://nyccas.cityofnewyork.us/nyccas2021v9/sites/default/files/NYCCAS-appendix/Appendix1.pdf). Our prediction map is presented in Fig. 6 and error is 2.02 μg/m3. Given that the 2020 NYCCAS predictions are also modeling results, a low correlation between the two models is anticipated. Still, the statistics demonstrate satisfactory performance of our prediction model.

We acknowledge a few shortcomings of the datasets. Firstly, the low-cost OPC we use for PM measurement is known for its deteriorated performance in high-humidity environments, as it cannot differentiate PM from water droplets in the air. Therefore, our datasets do not include observations collected in >90% relative humidity. Secondly, the Boston and

Beirut data sets were calibrated with research-grade sensors rather than reference-grade ones. The research-grade sensors used in Boston were calibrated at a reference station immediately before the mobile deployment. In Beirut, the research-grade sensors were the only available option for local calibration, given that no government-regulated reference stations existed. We do not consider this would lead to significant biases in the published datasets. Thirdly, our temperature and humidity data have not been calibrated against reference monitors as they are not the main focus of our deployments. In this case, their validity has not been adopted as a criterion for data cleaning, which aims to preserve the maximal number of valid observations for particulate matter..

Code availability

We provide air quality data stamped with time and location,

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RAWSEP View: This article about the Wood Pellets market looks at all wood pellet markets, and does not question use of wood burning because it emits particulates and CO2 at a higher level than the coal burning it replaces. This is a 105 page paper about the markets for wood pellets around the world.

PM2.5 and Technology
Wood Pellets Market Share, Trends By 2030 | 105 Pages Report | MENAFN.COM
menafn
Wood pellets are the most common particulate fuel and are typically milled from compacted sawdust and wood. This report covers a research time span ...
Wood Pellets Market Share, Trends By 2030 | 105 Pages Report
8/3/2023.
(MENAFN- The Express Wire)
<mark>Excepts edited by RAWSEP for brevity and clarity and relationship to Residents Against Wood Smoke Emission Particulates.</mark>
[105 Pages Report] " wood pellets market " Research Report Insights 2023 Based on Regions, Applications (Power Plants, Residential Heating, Commercial Heating, Combined Heat and Power (CHP)) , and Types (Low-grade Wood Fiber Source, Tops and Limbs Source, Others) . The report presents the research and analysis provided within the Wood Pellets Market Research is meant to benefit stakeholders, vendors, and other participants in the industry. The Wood Pellets market is expected to grow annually by magnificent (CAGR 2023 - 2030).
<mark>Who is the largest manufacturers of Wood Pellets Market worldwide?</mark>
<mark>Drax Group</mark>
<mark>Pinnacle Renewable Energy</mark>
<mark>Enviva Partners</mark>
<mark>Valfei Products Inc.</mark>
<mark>Graanul Invest</mark>
<mark>Fram Fuels</mark>
The global Wood Pellets market looks promising in the next 5 years. As of 2022, the global Wood Pellets market was estimated at USD million, and is anticipated to reach USD million in 2028, with a CAGR of Percent during the forecast years.
Wood pellets are the most common particulate fuel and are typically milled from compacted sawdust and wood.
This report covers a research time span from 2018 to 2028.
get a sample copy of the wood pellets report 2023
What are the factors driving the growth of the Wood Pellets Market?
Growing demand for below applications around the world has had a direct impact on the growth of the Wood Pellets
Power Plants
Residential Heating
Commercial Heating
Combined Heat and Power (CHP)
What are the types of Wood Pellets available in the Market?
Based on Product Types the Market is categorized into Below types that held the largest Wood Pellets market share In 2023.
Low-grade Wood Fiber Source
Tops and Limbs Source
Others
Which regions are leading the Wood Pellets Market?
North America (United States, Canada and Mexico)
Europe (Germany, UK, France, Italy, Russia and Turkey etc.)
Asia-Pacific (China, Japan, Korea, India, Australia, Indonesia, Thailand, Philippines, Malaysia and Vietnam)
South America (Brazil, Argentina, Columbia etc.)
Middle East and Africa (Saudi Arabia, UAE, Egypt, Nigeria and South Africa)
This Wood Pellets Market Research/Analysis Report Contains Answers to your following Questions

What are the global trends in the Wood Pellets market? Would the market witness an increase or decline in the demand in the coming years?

What is the estimated demand for different types of products in Wood Pellets? What are the upcoming industry applications and trends for Wood Pellets market?

What Are Projections of Global Wood Pellets Industry Considering Capacity, Production and Production Value? What Will Be the Estimation of Cost and Profit? What Will Be Market Share, Supply and Consumption? What about Import and Export?

Where will the strategic developments take the industry in the mid to long-term?

What are the factors contributing to the final price of Wood Pellets? What are the raw materials used for Wood Pellets manufacturing?

How big is the opportunity for the Wood Pellets market? How will the increasing adoption of Wood Pellets for mining impact the growth rate of the overall market?

How much is the global Wood Pellets market worth? What was the value of the market In 2020?

Who are the major players operating in the Wood Pellets market? Which companies are the front runners?

Which are the recent industry trends that can be implemented to generate additional revenue streams?

What Should Be Entry Strategies, Countermeasures to Economic Impact, and Marketing Channels for Wood Pellets Industry?

Wood Pellets Market - Covid-19 Impact and Recovery Analysis:

We were monitoring the direct impact of covid-19 in this market, further to the indirect impact from different industries. Final Report will add the analysis of the impact of Russia-Ukraine War and COVID-19 on this Wood Pellets Industry.

(a)

New York PM2.5 levels (ug/m3)
1.05 - 3.38
3.38 - 3.93
3.93 - 4.78
4.78 - 6.64
6.64 - 13.53

(b)

New York PM2.5 levels (ug/m3)
0 - 0.65
0.65 - 1.92
1.92 - 4.42
4.42 - 9.24
9.24 - 3267.02

(c)

Boston PM2.5 levels (ug/m3)
0.47 - 1.27
1.27 - 1.48
1.48 - 1.9
1.9 - 2.31
2.31 - 7.97

(d)

Beirut PM2.5 levels (ug/m3)
0.6 - 15.2
15.2 - 22.8
22.8 - 34.1
34.1 - 67.1
67.1 - 4753.6

PM2.5 CS Measurement Fall 2021 (ug/m3)
2.7 - 4.09
4.09 - 4.54
4.54 - 5.05
5.05 - 5.64
5.64 - 9.56

0   3   6 km