**Green Warriors: Paris Metro**

**English Script**

Key:

Commentary

French dialogue (subtitle)

English dialogue

00:00:04

**Commentary:**
Our investigation begins at nightfall, in Place de la République in Paris.

For the capital’s residents, the glow of headlights and street lamps acts as a guide for nocturnal life. But tonight, it is this particular light that will launch our investigation.

00:00:26

**Jean-Baptiste Renard:**

The difference between the moment we come closer and can’t really see the beam and the moment when we move over the vent is extraordinary. We have a lot more light and all the small particles and of course larger particles.

00:00:39

**Commentary:**

Jean-Baptiste Renard is the research director at the CNRS laboratory of physics and environmental chemistry. He studies a type of pollution that is invisible to the eye. It is revealed in the evening thanks to this fine particle lamp. These particles are released by the city’s underground.

00:00:57

**Jean-Baptiste Renard:**

So all this is coming from the metro, the air vent spits out these particles.

00:01:01

**Martin:**

What exactly is it?

00:01:04

**Jean-Baptiste Renard:**

These are PM25 particles, so mainly particles of metallic origin.

00:01:09

**Commentary:**

PM25. Fine particles whose diameter is equal to 2.5 microns, 50 times smaller than a hair. They are particularly harmful to people’s health.

00:01:22

**Jean-Baptiste Renard:**

We know that the smaller the particles are, the more likely they are to enter the body.

It’s important to know that we breathe in all this stuff!

I personally think it should be forbidden, we should at least have barriers or something, so that we don't directly breathe everything that comes out of this air vent.

00:01:41

**Commentary:**

Air pollution in underground rail transport networks. This is the investigation that we wish we didn’t have to carry out. This means of transport is essential in the fight against global warming, as the alternative to cars. In the Paris region, 8 million people use the metro and the regional RER rail network every day.. The Paris Transport Administration, or RATP, ensures that the air is safe and under control.

00:02:12

**SOPHIE MAZUET:**

It is important for us to monitor the air quality that we offer to our travelers and employees. We have the most monitored network in the world because we have different air quality parameters.

00:02:23

**Commentary:**

Nonetheless, travelers and employees complain about particle levels.

00:02:31

**Bastien Berthier:**

I take my treatment twice a day. I have asthma for life now. The metro made it worse.

00:02:42

**Matilde:**

Here we are, just above the RER train passing by. I think it’s going to be pretty good for a sample.

00:02:53

**Commentary:**

We are journalists.

With the help of scientists and our team of investigators, we will conduct an unprecedented study on air pollution in the metro and RER for 8 months.

We will measure the particle levels of all the stations but also the heavy metal contamination.

Tens of thousands of pieces of data…

Which we will present to the public…

00:03:26

**François Xavier Arouls:**

Finally we have a study underway. And we continue the fight with you, thank you!

00:03:34

**Commentary:**

Our revelations will be covered by 43 media outlets…

00:03:37

**France 2:**

In today's news: an investigation has raised concerns about air pollution in the Paris metro, the figures are quite alarming.

00:03:42

**RMC:**

Results of a new study carried out for the Green Warriors show on France 5.

00:03:46

**France 3 :**

The Green Warriors series broadcast on France 5 brings new information to light.

00:03:51

**Commentary:**

Our investigation will go as far as New York where researchers are using our method to investigate the air quality in their underground network.

00:04:32

**Commentary:**

In the Paris region, Gwenaelle Dubois, 25, is one of the first people affected by fine particles. The young woman is an engineer and in order to get to work, she has to take an RER train every morning: a regional express train. Then another one, which travels under the capital city. Gwenaelle Dubois spends a little more than an hour every day in these underground transport networks. But the young woman has been asthmatic since birth, and the air in the confines of the railway often causes her serious asthmatic reactions.

00:05:15

**Gwenaelle:**

My last asthma attack on public transport happened after ten to fifteen seconds. It started with a very dry throat and then it turned into a coughing fit.

This coughing fit can last anywhere from 10 minutes to several hours.

There is always this fear that I won’t survive the next attack.

Sometimes we get smells from the sewer outlet, things that come up, sometimes it also smells like plastic, or metal too ... and then there are other smells too that I don’t recognise but they’re not nice.

And suddenly I feel more anxious anyway, oppressed, because I am more prone to a potential asthma attack.

00:06:06

**Commentary:**

Over the last few months Gwenaelle Dubois' asthma has only gotten worse.

So much so that she now has regular appointments with a pulmonologist.

00:06:18

**Gwenaelle Dubois:**

The last attack I had was in the RER in the evening, I really didn’t feel well, I started tearing up, I felt very warm, and it’s like that all the time in transport.

00:06:30

**Doctor Wahid Amad:**

As you know, coughing is a symptom of asthma.

Obviously there are several contributing factors in the metro, like air stagnation obviously, no ventilation, and suddenly you have an accumulation of both fine and large particles. The large particles will stick to the nose or trachea, but there are fine particles that will enter the alveoli, which will pass into the blood circulation and will trigger this inflammatory and allergic avalanche and will cause bronchial hyperactivity and trigger the asthma attack.

There is an effect not only on respiratory diseases, but also on heart diseases, on the nervous system, on cancers, on the cardiovascular system. There are studies that show that 30% of chronic lung diseases are caused by pollution.

We are aware that pollution is a real danger to people.

00:07:31

**Commentary:**

To assess the effects of pollution on the young woman's lungs,

Doctor Wahid Ahmad carries out a respiratory examination.

00:07:41

**Doctor Wahid Ahmad:**

It's a nose clip, you'll only be able to breathe through your mouth.

So then you're going to put this in your mouth between the teeth.

You will breathe slowly through the machine. Exhale, inhale, exhale, inhale. You’re going to inhale deeply deeply deeply deeply and exhale strongly strongly strongly strongly, keep going keep going! And breathe.

You’re struggling to blow all at once very hard, so you’re a bit short of breath ... this is called the peak expiratory flow, it has decreased a little bit so your maximum breathing force in the first second has decreased a little I think…

Obviously if you take public transport, especially the metro where everything is closed and there is no proper ventilation, well, the impact of pollution is greater on your bronchi and you risk triggering an attack, especially if you don't take your medications correctly.

00:08:43

**Commentary:**

Does the air in the Paris metro really affect people with asthma and travelers in general?

How polluted is it?

To find out, we need the help of air quality specialists.

On the company’s premises, these scientists analyze the atmosphere of about thirty capitals, seven days a week, 24 hours a day.

Thanks to revolutionary optical sensors, a concentrated technology in a box the size of a mobile phone, they have installed nearly 3,000 of them across Europe, on behalf of local authorities.

00:09:29

**Jeremy:**

Can you give me the data from Budapest?

00:09:31

**Scientist:**

In Budapest, we have 40.8 on a 24-hour average.

00:09:33

**Jeremy:**

Okay, that makes sense.

00:09:36

**Commentary:**

Jeremy Surcin is a climate scientist and analyst.

He collects and processes data from air sensors.

For our investigation, he lends us their latest model.

00:09:50

**Jeremy Surcin:**

That is a Polluttrack pollution sensor, it will measure fine particles, PM25 in this case. So the mobile phone will power the sensor. I plug it in and now the data will be displayed in a minute. So we have to wait a little, but the data regarding pollution will be displayed here.

00:10:12

**Martin:**

And on the subways and RER, would it be useful for you to have more data?

00:10:16

**Jeremy Surcin:**

Yes because having enough data is good as we will be able to make comparisons. The more data we have, the more we can study and the more we can carry the analysis in a much more in-depth way, so it is beneficial.

00:10:28

**Commentary:**

This air sensor is as effective indoors as it is outdoors.

Its optical sensitivity allows it to provide measurements to the nearest microgram.

00:10:39

**Martin:**

What have we got here?

00:10:40

**Jeremy Surcin:**

We’re at less than one microgram per cubic meter. Here, we have very clean air. We can take a good breath of fresh air. It is better to stay outside today than to stay inside. It's a good day to go out.

00:10:57

**Commentary:**

We will combine this technology with the expertise of Professor Renard, the CNRS researcher …

00:11:07

**Matilde:**

Now that we have a sensor, what do you think is the best methodology to study the pollution in the metro?

00:11:14

**Jean-Baptiste Renard:**

It is necessary to follow a precise protocol through several steps, first the most logical place in the station is to go to the end of the platform opposite the metro, when it arrives.

Because this is where the particles come from, when the brakes are applied. These particles will come from the friction between the brakes and the wheels but also between the wheels and the tracks.

It is necessary to start at a time when there is a lot of activity, typically from 6pm to 8pm on weekdays obviously.

Going through all the stations is ideal! If we assess all the stations, we will gain a clear understanding of the heterogeneity of the network.

And there is a lot of work

00:11:56

**Commentary:**

For 8 months, alongside our team of twelve journalists, we have been measuring the levels of fine particles throughout the Parisian underground network and the outskirts, known as La Petite Couronne.

332 metro and RER stations

435 platforms.

00:12:24

**Edouard:**

With the two trains arriving at the same time, we’ve just gone up to 29.50.

00:12:27

**Commentary:**

In France, there is no mandatory air quality standard for train stations.

So we are basing our research on the recommendations of the World Health Organization for outdoor air, i.e. a limit of 5 µg per m3 for PM25.

00:12:45

**Martin**

30.25 - we are more than 6 times above the WHO recommendations.

00:12:54

**Matilde:**

90 micrograms per cubic meter, we are practically 20 times higher than the thresholds recommended by the WHO.

00:13:02

**Amanda**

114

00:13:06

**Margaux:**

Wow! 130

00:13:09

**Commentary:**

Our first measurements seem to show that the air inside the stations is particularly polluted. But Professor Renard needs another round of samples.

00:13:20

**Jean-Baptiste Renard :**

It’s very important that as soon as you’ve taken a measurement in the metro, you step outside the station and measure the air there too. That’s because the air inside the station is a combination of the outside air and the pollution generated by the metro.

00:13:39

**Commentary:**

We accumulate tens of thousands of data that Jean-Baptiste Renard will process over the months.

The scientist also suggests that we take an interest in air vents, such as those on the Place de la République, where we met him at the very beginning of our investigation.

00:13:59

**Martin :**

33, more than 6 times over.

00:14:06

**Commentary:**

In the capital, there are more than 300 air vents like this one.

Close to shops.

00:14:11

**Matilde:**

We just got to 51. This is 10 times higher than the thresholds recommended by the WHO. And all that goes directly towards the fruit and vegetable aisle.

00:14:23

**Commentary:**

Others are close to public squares often frequented by children.

00:14:31

**Martin**

37. We are on average 7 times above the WHO’s recommendations. Everywhere there are children playing.

00:14:43

**Martin**

It makes your head hurt. 83 !

00:14:47

**Commentary:**

That is almost 17 times above the WHO thresholds.

These vents emit much more polluted air than ambient air.

And the most contaminating ones might be hidden among Parisian buildings.

At first glance, these are apartments with windows and railings. Enough to fool any passer-by.

But these are only facades, behind, there is no housing at all, the RATP installed one of its giant wind tunnels there. Access is prohibited to the public.

00:15:23

**Matilde:**

Ha! We're lucky today.

Look, there's a map here, it’s a map of the Parisian metro. So this place is circled on the map and there are few others like that, including Charles de Gaulle Étoile and Villiers Nation.

00:15:39

**Commentary:**

It is thought that there are around a dozen installations like this in Paris.

Here, no hall or mailboxes, just darkness, and a sound behind that hatch.

00:15:56

**Mathilde:**

Ok, supposedly it should work …

00:16:14

**Commentary:**

We descend into the abyss of the capital, several tens of meters underground.

Until we find ourselves at the top of these rails.

00:16:25

**Matilde:**

Wow. We are just above the RER passing by.

It's shaking. Be careful this one is not stable.

I think this is a pretty good spot to take samples.

00:16:42

**Commentary:**

The air flow is very intense.

We use this device whose fine particle sensor makes it possible to analyze larger volumes.

00:16:57

**Matilde:**

We're at 156 now.

00:17:00

**Commentary:**

That is 31 times higher than the thresholds recommended by the World Health Organization.

00:17:07

**Mathilde:**

We're going to check in the other room to see if the numbers are the same.

I'll try to make it quick before there are people coming.

It's blowing... It's not bad here.

00:17:26

**Matilde:**

Oh yes, we just went up to 253, 267, 287, that's huge.

00:17:35

**Commentary:**

287 mg per m3,

This is 57 times higher than the WHO thresholds.

00:17:42

**Matilde:**

It smells like a very bad polluted day in Paris

Look, that’s all the pollution present in the tunnels and then it ends up in the metro stations.

It’s the end of the chimney up here, this is where all the particles come out.

00:18:00

**Commentary:**

Are these particles present in the neighbourhood?

To find out, we must get onto the roofs.

00:18:15

**Martin:**

Here, come here, it's okay..

00:18:19

**Commentary:**

The procedure is dangerous.

We are accompanied by Vintage Tran: he is an urban explorer whose specialty is moving across the roofs of Paris.

00:18:31

**Vintage Tran:**

I advise you to slightly put your foot on what we call the feather joints, it will allow your body to be better balanced so as not to slip. And it’s slippery here, you see.

00:18:42

**Commentary:**

The air outlet is several tens of metres away…

We have to be careful.

00:18:53

**Vintage Tran:**

So you see, lightly on the joints, don't put too much weight on the chimneys either.

Here we are, that’s the vent.

00:19:04

**Martin:**

We can feel the air and the smells that come back up.

00:19:09

**Vintage Tran:**

I'll try to find somewhere we can get through …

00:19:13

**Vintage Tran:**

It's going to be complicated that way

00:19:17

**Commentary:**

We are 18 metres above the ground, and there is no ladder allowing us to come down onto the vent.

00:19:23

**Vintage Tran:**

Hold that..

So, I'm going to tow you down to put you down gently onto the metal sheet

00:19:32

**Martin :**

Ok!

00:19:33

**Vintage Tran:**

Is that alright? Let's go, let's go.

Little by little

OK.

00:19:53

**Commentary:**

We are carrying out new air sampling.

00:19:55

**Vintage Tran:**

93..

00:19:57

**Martin :**

94

Ok we're going to go do the same a little bit to the left.

105, 126, 110

114, 118, 126

00:20:14

**Martin:**

Here it is 20 times more than the WHO standards for air quality recommended outdoors.

00:20:20

**Commentary:**

Even tens of metres above the surface, the air coming out is still loaded with fine particles.

00:20:29

**Martin:**

This smell is unbearable.

00:20:31

**Commentary:**

Do these discharges make their way into the apartments nearby?

To answer this, we call on the climatologist and analyst Jérémy Surcin, specialist in air quality in Europe.

00:20:44

**Jeremy Surcin:**

Good morning

It just needs an electrical outlet.

00:20:50

**Commentary:**

With his help, we install sensors in the homes of local residents.

Like Denis Mantelin, whose windows are only a few meters from one of these chimneys.

00:21:04

**Denis Mantellin:**

Well, it worries me a little, I’m glad I let you in, at least we’ll find out something about our environment.

00:21:12

**Matilde:**

So the air vent is right there. In terms of putting the sensor, how are we doing?

00:21:18

**Jeremy Surcin:**

We're pretty good. We will actually be able to evaluate what people are breathing and we’ll be able to measure the diffusion of particles, roughly.

00:21:28

**Commentary:**

Thanks to this sensor installed on the windows, we will measure, for the first time ever, the impact of the RATP air vents on the surrounding neighbourhood.

Denis Mantelin already knew about this vast chimney.

He has also kept a rare record of it: an old press article announcing its construction.

00:21:48

**Matilde:**

So this is an article that dates from Tuesday, May 27, 1980

00:21:53

**Denis Mantelin:**

At which point I had already lived here for two years.

When I bought this place, there was already a big hole, only the facade was built.

So you’ve put the sensor right here, facing the street.

00:22:07

**Matilde:**

And we can see that the street is right here.

00:22:12

**Commentary:**

In order to plot on a map the spread of particle pollution, we place sensors in a dozen neighbouring homes.

00:22:22

**Martin:**

The fireplace is just to the right! The walls are pretty damn black here.

00:22:32

**Martin:**

I'm taking a picture to get the precise GPS point. Ok that's good.

00:22:45

**Jeremy:**

It's okay.

00:23:00

**Mathilde:**

Jeremy, the air vent is right there.

00:23:03

**Jeremy:**

We're in a good place, yes.

You can see that the wall is blackened by the carbon that comes from the metro and the RER.

00:23:10

**Mathilde:**

Like in a chimney pipe basically?

00:23:13

**Jeremy:**

Yeah, that’s it. When you see that black colour on the wall, you can’t help but think about what people are actually breathing in.

It's okay, it's on!

00:23:25

**Commentary:**

We leave the air sensors for two months.

They will record the particle levels, 24 hours a day, 7 days a week.

There are no health studies on the impact of these metro and RER air vents.

What about those who work in close proximity to this source of pollution?

Those who spend almost 8 hours a day in the RATP tunnels?

00:24:02

**Bastien Berthier:**

I have asthma attacks, going up the stairs is becoming difficult. Playing sports is becoming impossible.

00:24:07

**Commentary:**

Bastien Berthier is 42 years old. He is a metro conductor.

And since he started this job, his health has been deteriorating.

00:24:14

**Bastien:**

I had a respiratory illness, no one knows where it came from. So I was treated for a year, then I was hospitalised.

00:24:22

**Commentary:**

In his opinion, there is no doubt about it: the pollution of the subway is responsible for his health problems.

00:24:31

**Bastien:**

Following a respiratory problem, I had surgery in July 2016, so this is a return from radio and examination in October 2016, to verify that the operation had gone well. I had trouble breathing so I ended up at the doctor’s who gave me a first treatment. It didn't pass, then a second treatment, then I had trouble breathing, eating, I lost more than ten kilos in ten days. It got worse. Today I need to take lifelong treatment.

00:25:00

**Commentary:**

In 2022, this elected staff representative wrote to the Ministry of Health to raise awareness of RATP agents’ exposure to air pollution.

He fills his letter with studies on fine particles.

But his warnings remain ignored.

00:25:23

**Bastien Berthier:**

Indeed, on September 10, 2022, during the European Cancer Congress in Paris, scientists demonstrated how air pollution via exposure to fine particles could, in some people, cause lung cancer. At the end, we requested a meeting with competent public authorities to find solutions and solve this public health problem. It was September 27 in 2022. And as of today, we still haven't had any meetings on this topic.

00:25:51

**Commentary:**

Bastien Berthier also writes to the RATP management, who assures him in return that they have not noticed any excess mortality among their employees.

00:26:00

**Bastien Berthier:**

For us, our main concern is health. Meaning everything that is related to respiratory asthma, heart problems, tachycardia.

00:26:10

**Bastien Berthier:**

Today, a lot of my colleagues have respiratory problems, heart problems.

00:26:16

**Commentary:**

This afternoon, Bastien Berthier has an appointment with other sick employees.

For months, he has been collecting testimonies to convince RATP and the Ministry of Health to act.

00:26:29

**Bastien:**

Thank you all for coming, as you know this is an important topic that is also close to my heart.

00:26:35

**Commentary:**

These metro drivers have asked us to guarantee their anonymity, for fear of reprisals from their superiors or of being deemed unfit for work.

Within the profession, these health problems remain taboo.

00:26:51

**Bastien Berthier:**

Let's have a quick update on everyone's health, find out where we are, your treatments.

00:26:54

**Pierre:**

Yes, I renewed my prescription for the medicine, for my hypertension. It happened after eight years of working in the subway.

00:26:06

**Pierre:**

It was symptoms like panic attacks, like a little ringing in the ears. There is a sensation in the chest too so the first thing you think of is a heart attack. The first time it happened to me was at the end of my shift.

00:27:27

**Commentary:**

This driver, on the other hand, ended up directly in hospital.

00:27:32

**Aurélien:**

I’ve had severe chest pains. I felt irradiated from the heat, I could no longer breathe. I came out and I went straight to the emergency room to consult. So it turned out that indeed, I was having an anxiety attack or a tachycardia attack.

00:27:49

**Matilde:**

and you are not someone who usually suffers from stress?

00:27:50

**Aurélien:**

No, not at all, no

00:27:51

**Commentary:**

Elodie Do Vale has been a station agent for 9 years.

She has seen her health decline over the years, according to her, because of her work.

00:28:02

**Elodie:**

I started working at the RATP when I was 20 years old, I was sporty, in great shape. And then two, three years later, my eyesight got bad, which is very common among station agents. But when I went to the ophthalmologist, he told me that it could have something to do with the pollution of the subway and that was the first time I had heard about it. I started coughing. And then my lungs started wheezing too. So I was told that I had asthma, although I have no history of asthma and no family members with asthma.

00:28:39

**Matilde:**

Is that why you're agreeing to speak today?

00:28:40

**Elodie:**

Yes, completely, because I think there is a causal link that is not demonstrated. Then why? I haven't got a clue. Maybe that... I don't know, I think there's also a vow of silence regarding the subject.

00:28:51

**Anonymous man:**

If my colleagues blow their nose at the end of their shift, the handkerchief is black.

00:28:58

**Matilde:**

What comes to your mind when you see this?

00:29:00

**Bastien Berthier:**

It’s as if we’re coming back up from the mines.

00:29:01

**Commentary:**

What exactly is found in these fine particles that these RATP employees fear so much?

Professor Renard will help us to go further in our investigation.

00:29:19

**Jean-Baptiste Renard:**

In fact, the sensors that you used provide a number of particles but do not provide their composition, so the next step is to go and take air samples through appropriate techniques, and then analyse this air in the laboratory and analyse in particular the small particles that would have been trapped in shared air.

00:29:38

**Commentary:**

Equipped with filtered pumps, we head off to a dozen stations.

We take air samples there for 60 minutes.

The first results indicate the presence of heavy metals.

But are we actually breathing them in?

We will find out by going to the Lariboisière public Hospital in Paris.

Joël Poupon is a biologist specialising in toxicology.

His laboratory is renowned for the search of heavy metals in the human body.

00:30:23

**Martin:**

Here are the nose filters.

00:30:26

**Commentary:**

With him, we will carry out an unprecedented study.

Thanks to these nose filters.

We will evaluate metro and RER users’ exposure to heavy metals present in the underground air.

00:30:40

**Joel Poupon:**

This is going to be a big milestone. It's still very interesting anyway. And here we have no idea what the result will be.

For the study you want to conduct, we equip volunteer subjects who will carry them for a certain amount of time.

The result will show the quantity of metals on the filter and therefore it will have to be related to something. We will establish this correlation by looking at the litres of air inhaled by the person during their journey in the subway.

00:31:10

**Martin:**

What types of heavy metals can we find in these nose filters?

00:31:14

**Joel Poupon:**

There are metals which are present in the tracks, and which are emitted during braking, iron in particular. And then, as these are alloys, most often, we can look for metals such as nickel, chromium, molybdenum which are part of these alloys . Other metals that can be a little more problematic in terms of toxicity such as tin, antimony, arsenic, then heavy elements such as barium possibly. We can consider quite a few elements. Some are carcinogenic, others are not, and some may have neurological organ toxicity, renal toxicity, etc. It depends on the element, but again, the exposure route is very important, so here we are targeting the pulmonary route which is the first point of contact, the point of entry.

00:32:00

**Commentary:**

How many heavy metals will we find in these nose filters?

About fifty volunteers agree to wear them.

Metro users... like Gwenaëlle Dubois, the young asthmatic metro user, all wear them for 36 minutes there, and 36 minutes back. This represents the average travel time for home-work trips in the Paris region.

We also equip metro and RER drivers during a working day.

Finally, we call on people who go to work in the open air.. on foot ... or by bike.

Their filters, also worn for 36 minutes outbound and 36 minutes return, will serve as a standard of comparison compared to metro users.

All these filters will then be sent to Doctor Poupon's laboratory.

We will have to wait several months for the results.

As our investigation continues, a man gets in touch with us.

An elected official who wants to denounce the inertia of the RATP in the face of what he calls silent pollution.

Jacques Baudrier sits on the board of directors of Ile de France Mobilités, the public organisation that oversees the RATP.

00:33:57

**Jacques Baudrier:**

The RATP is dragging its feet. No one cares.

We know that this issue has been a concern for at least ten years. It is known that there is an issue of fine particles being emitted from braking. There are two permanent RATP measuring stations. We have the information, but the RATP is putting in place a whole bunch of other measures. So we asked them: can you give us the results of these measurements? And, they told us no: “no, we don't want to because they could be misinterpreted”. And the RATP refused to give the information. So I challenged them quite strongly. It is unbelievable that the RATP does not want to give information that interests all the people involved as well as us, the elected representatives of France Mobilités, when all this is done with public money that we grant them.

00:34:37

**Commentary:**

The RATP claims to have launched experiments to reduce the emission of fine particles, in particular in regards to the braking system. But these tests were only carried out on the Paris RER.

00:34:52

**Jacques Baudrier:**

So I told them that’s all well but you know, addressing the issue in the rail networks is good but the metro is much more important. So what are you doing regarding the metro? And the answer was, in other words, ‘Well, we’re doing nothing’.

00:35:06

**Mathilde:**

How do you explain this lack of transparency and communication regarding the measurements carried out and this lack of investment?

00:35:11

**Jacques Baudrier:**

It's going to cost at least 100 or 200 million euros. And on top of that, costs are changing. But basically we have to invest money into it. We have to put the money down and not hide the problems.

00:35:23

**Commentary:**

Will our study confirm the problems identified by Jacques Baudrier?

8 months after the start of our investigation, we finally get the results back. They are terrifying.

All metro and RER passengers are more exposed to heavy metals than people who travel outside, in the open air.

On average, the iron concentrations in their nose filters are 20 times higher.

Users also have 2.6 times more manganese than the toxicological value in the air set by the American authorities. Manganese by inhalation may be responsible for irritation of the respiratory tract and lead to neurodegenerative diseases.

A quarter of users inhaled nickel contents 2 times higher than the ambient air quality targets. Inhaling nickel can increase the risk of cancers of the nasal cavities and lungs.

As for the results of our air measurements carried out on all stations, they show that, on average, the excessive pollution generated by metro and RER traffic is 10.5 µg/m3, which is more than 2 times higher than the WHO recommendations.

This excessive pollution is added to the ambient air of Paris which infiltrates the stations. As a result, the overall pollution level in the network is on average 24 µg/m3, almost 5 times higher than the WHO thresholds.

Of the 21 lines tested, 14 have an air quality that exceeds the thresholds.

Line 5 is the line where the average excessive pollution caused by traffic is the most significant. Followed by the RER A and line 9.

Among the stations most affected by this excessive pollution, the PM25 level on the platform of line 2 of Belleville station is 12 times higher than the WHO recommendations, followed by La Défense on the RER A and Pont de Neuilly on line 1.

Given the magnitude of these results, we are organising a public meeting with Professor Renard, the air quality specialist, Joël Poupon from the toxicological laboratory of the Public Hospitals of Paris. And Jeremy Surcin, the climatologist and analyst.

00:37:50

**Martin:**

Hello everyone, thank you for all being here.

00:37:54

**Commentary:**

A hundred people came.

Denis Mantelin, who lives next to one of the giant air vents, is in the audience. Our results show that his building is exposed to 4 times more particles than WHO standards.

The people who participated in our study are also present, as well as metro drivers like Bastien Berthier, and other RATP employees.

Jacques Baudrier from île de France mobilities.

Elected officials and a member of parliament are also in the room.

Gwenaelle Dubois, the young asthmatic woman is present on screen.

Many media outlets are covering the event.

00:38:35

**Martin:**

We had 55 volunteers who agreed to wear a nose filter. And so Doctor Poupon, I pass the mic over to you.

00:38:42

**Joël Poupon:**

So this is a contaminated filter. For example, this one is completely black.

For most of the elements, they greatly exceed the values of the three controls in green.

For the drivers, we can already see that the filters showed much higher amounts, which is obviously expected with a much longer exposure time. But with a longer exposure time, there is a risk of saturation of the filters and an underestimation of the values.

00:39:24

**Jean-Baptiste Renard:**

There is still a real air quality problem in the underground enclosures and the situation is serious and for the staff who work there it is even more catastrophic. I think we need to be very clear about it.

When you have very violent vacuums taking the air from the stations and then throwing it into outdoor air with no shame, it is also a problem.

So it is clear that we must seriously tackle this issue.

00:39:48

**Frederic:**

Hello, my name is Frédéric Bourret, I served as a guinea pig for the study. Thank you for this study, it's scary, it makes you think. As metro users, we are not informed at all. I really pity the drivers.

00:40:04

**Bastien Berthier:**

The Ministry of Transport hides behind the fact that it is not legislated, that we can basically breathe in as much PM25 as they want. We hope that this study… We are going to send it to them today, we had to contact them after this study. We hope that it will move things forward.

00:40:18

**Commentary:**

Julien Bayou, deputy of Europe Ecologie Les Verts, steps onto the stage.

00:40:23

**Julien Bayou:**

Today, I speak not only as a member of parliament in Paris, with obvious concerns, but also as a metro user in the third and thirteenth arrondissement. I saw that these areas are in the Top 5 most polluted lines, thanks to lines 5, 8 and 9.

And so I'm also reconsidering quite a bit when, as a kid, I used to play above the subway vents because the air was warm. I admit that now I realise it was not the best idea in the world. From my end, I will call on the government and the Minister of Transport as soon as I can.

00:40:51

**Martin:**

One of the volunteers who couldn't come, has a question for you Jean-Baptiste Renard.

00:40:53

**Gwenaelle Dubois:**

What will be the next steps, the action plan, the continuation of this study?

00:41:01

**Jean Baptiste Renard:**

It is absolutely necessary that the RATP finally brings together researchers around the same table, so that we can finally discuss together a strategy on how to make the measurements and follow the protocol. We will see what we can propose as ideas, see what is feasible and do a study over a year or two, to really look out for trends and work to identify problematic stations.

00:41:29

**Commentary:**

We hand over the results to the volunteers who wore the nose filters.

00:41:36

**Isabelle Tassy:**

The results are pretty scary, I didn't think it was that bad.

00:41:40

**Sarah:**

I've found out that I still have red results on manganese, copper, iron and nickel, so it's a little scary.

I realise I am relatively young, and I wonder what effect it might have on my health in the long term if I continue to use these transports.

00:41:57

**Frederic Bourret:**

I have a son who is 12 years old. Me breathing in this pollution is one thing, but knowing that my son, whose lungs are barely formed, is breathing it too, is much more problematic.

00:42:07

**Commentary:**

Journalists are closely listening to our revelations.

00:42:13

**Jean-Baptiste Renard:**

You may have much longer-term pathologies such as cancers or neurological diseases.

00:42:17

**Commentary:**

On the same day, our results are released by 43 media outlets.

00:42:25

**France 2:**

Today's news: an investigation into air pollution in the Paris metro, the figures are quite alarming.

00:42:30

**M6:**

Notice to travellers, the fine particle pollution in the Paris metro is much higher than levels recommended by the WHO.

00:42:37

**RMC :**

Let's go to the Paris metro where air pollution is causing concern, the result of a new study carried out for the Green Warriors program on France 5.

00:42:44

**France 3 :**

The Green Warriors series broadcast on France 5 brings new information to light.

00:42:48

**France Info:**

Fine particles measured at levels up to 19 times higher than the WHO recommended threshold.

00:42:55

**France Info :**

It would be necessary to do a large-scale substantive study. The idea is to open up a debate.

00:43:00

**Bastien Berthier on TV:**

What we would like today is for the legislator to implement a law regarding heavy metal particles in the metro. All we want is for all this to be taken seriously.

00:43:09

**France Bleu :**

Now we have a precise mapping of fine particle pollution on the various lines and stations of the network.

00:43:16

**C-News :**

The RATP, for its part, disputes all these figures.

00:43:20

**Commentary:**

The CEO of the RATP, Jean Castex, initially refused to see us. But in the face of media outcry, he finally accepted our request for an interview.

00:43:33

**Matilde:**

What did you think of this survey?

00:43:36

**Jean Castex:**

A lot of things. I first saw it as a spur to action, that is to say that I cannot imagine that you are motivated by bad intentions. Neither am I. So we have to move forward with the issue. I perceived it as a contribution to the advancement of the conversation.

There are no standards. You have also said it yourself in regards to indoor air, in underground railway stations.

00:44:09

**Martin:**

You’d like that to exist?

00:44:10

**Jean Castex:**

Yes, sir, of course. At least we would have a reference point , we would stick to it. There are none. Let me remind you that you also quote the World Health Organization a lot, so same here, these are recommendations, they are not enforceable standards.

First, I will tell you right away that we are in the process with Airparif and at the request of the IDFM to increase the number of recordings.

We will also increase or make specific measures for the vents, the air outputs, the air vents. Since we have a number of questions that have been expressed about the quality of the air at the exit of these vents.

00:44:50

**Matilde:**

And the nose filters that our participants wore showed high levels of metals, including heavy metals. Today, what is the message you want to convey to metro users? Is it dangerous to take underground transport?

00:45:04

**Jean Castex:**

In terms of comparison, and unsurprisingly, low-carbon modes of transport have less impact than cars and all carbon-based modes of transport.

So for metro users, as I told you, we will further increase the measures in terms of scope and efficiency. And we’re about to, or we have just signed a new epidemiological study with Public Health France.

We have a program underway, which will run from 2021 to 2024, which represents a budget of 57 million euros, with which we will actually increase the number of fans, amplify their power, etc.

We want to generalise what is called electric braking rather than mechanical braking. We want to have brake linings that emit the least possible. We also want better filters.

00:46:02

**Martin:**

Do you think that the underground’s air quality will improve within the next two years?

00:46:06

**Jean Castex:**

if we do everything we've planned, it should be expected. First, I hope we can measure it better. Finally, I hope that the public authorities, health authorities, will set standards. It's not up to the RATP to decide.

These topics are serious topics. We must treat them seriously and with transparency.

00:46:23

**Commentary:**

Jean Castex promises a rapid improvement in the air quality in the underground.

Insufficient for metro and RER users, they gather as part of the charity ‘Respire’, file a complaint against the RATP and instruct their lawyer to include our study in the procedure.

An investigation has been opened for "endangering others and deception resulting in a danger to human health".

At the National Assembly, the environmentalist deputy Julien Bayou challenges the government.

00:47:04

**Madame la Presidente:**

The stage is yours, Julien Bayou.

00:47:06

**Julien Bayou :**

Thank you, Madame la Presidente, Minister.

On 23rd May, journalists from the investigative program Green Warriors on France 5 published the results of their study on air quality in the metro conducted under the authority of a CNRS researcher. They have analysed for many months the 332 stations of the network at rush hour, their conclusions are disturbing, alarming.

There has been a justified expression of a strong concern for RATP employees, drivers, reception agents, but also security or household companies who are constantly exposed during their working hours to this polluted air and therefore to diseases, vascular and pulmonary diseases. This is absolutely unacceptable.

So, Minister, what are you going to do to get the government to finally take action?

00:47:55

**Commentary:**

Initially, the Minister of Transport, had also refused to meet with us, but he ended up accepting our invitation.

Clément Beaune insists: we must first review all the regulations.

00:48:11

**Martin Boudot:**

Do you want there to be thresholds for indoor air that could also be applicable to underground rail transport?

00:48:19

**Clement Beaune:**

It is very important to say it, you are right because sometimes we compare things which are not comparable. There are no international or European standards from the World Health Organization, in particular on the air inside railway structures. Is it necessary to do it? Yes. There will be no more debate about what the right point of reference is and what the right threshold is. I think it encourages trust too. Yes, I am in favour of it.

00:48:39

**Martin Boudot:**

You, as Minister of Transport, are also asking the RATP to go faster, to accelerate?

00:48:43

**Clement Beaune:**

Yes, of course, moving faster means financing and investments. That's what we're doing right now. We support the purchase or investment in new equipment, new trains, extensions. All this is a joint effort led mainly by the Region, supported by the State. So yes, I say let's speed up.

And then I also say it since I am in charge of transport nationally. Your investigation shows the metros in Paris, but we have similar transport networks across the whole country. If we had, for example, every two or three years, a major national survey on our transport networks, it would be even better.

But I'll say it again, we have confidence in public transport, we can take the metro, it's a gesture for the environment and it's not a health risk, far from it.

00:49:19

**Commentary:**

Since our study, the authorities have asked RATP to publish all of its data and to accelerate the deployment of filters on the brakes to reduce particle emissions.

One year after the start of our investigation, our results make their way to the United States.

At New York University, Terry Gordon, a celebrated professor of medicine, specialist in air quality in transport networks, is inspired by our work. In particular, the use of nose filters.

00:50:03

**Terry Gordon:**

Hello Joel. Good to meet you.

00:50:06

**Commentary:**

He has been in contact for a few weeks with Joël Poupon, the biologist of the heavy metals laboratory of the Paris hospitals. Terry Gordon's team wants to replicate our device in the New York subway.

00:50:19

**Terry:**

So to use the nose filters it's sort of intriguing it might give the actual dose that the person would be inhaling, right?

00:50:27

**Joël Poupon:**

We calculated the quantity of each metal on a filter, then we determined the volume of air inhalation based on a ratio of 8 litres per minute, on a basis of 72 minutes.

00:50:43

**Terry Gordon:**

How do you know that the amount, what you measured, is what's coming from the subway?

00:50:48

**Joel Poupon:**

3 people wore the nose filters outside the subways, in the streets, in Paris. So for most of the elements the levels outside were very low.

00:51:00

**Terry Gordon:**

We are trying to duplicate what you've done! And we have already got approval from the human review board and we plan to help participate. I think this is very nice for looking at the inhaled dose.

00:51:15

**Joël Poupon:**

So Terry! Have a nice study!

00:51:19

**Terry:**

Yes, and I hope to keep in touch.

00:51:26

**Commentary:**

Terry Gordon and his team are developing their own nose filters to measure the levels of heavy metal pollution in the subway.

They should publish their results in the coming months.

From Paris to New York, the warning to improve air quality in underground transport has finally been launched.