



Rethinking the
future of exercise
in the city of Paris

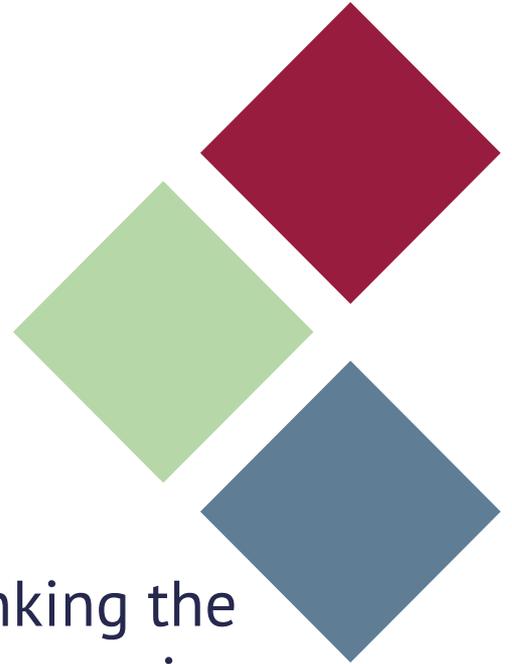




TABLE OF CONTENTS



01 INTRODUCTION
Who we are

02 THE ISSUE
Air pollution, urban heat island effect,
benefits of exercise, and SDGs

03 PAST PROPOSALS
Policies and efforts aimed to improve
air quality and promote exercise

04 SOLUTION
Pollution-free exercise zones

05 BIOLOGICAL INSPIRATION
How our innovation relates to
natural processes

**06 PARTNERSHIPS & FUNDING
STRUCTURE**
What we need to make this
happen

**07 IMPLEMENTATION & PLAN OF
ASSESSMENT**
How we will gauge success

08 WORK CITED
What sources we used

INTRODUCTION: OUR TEAM



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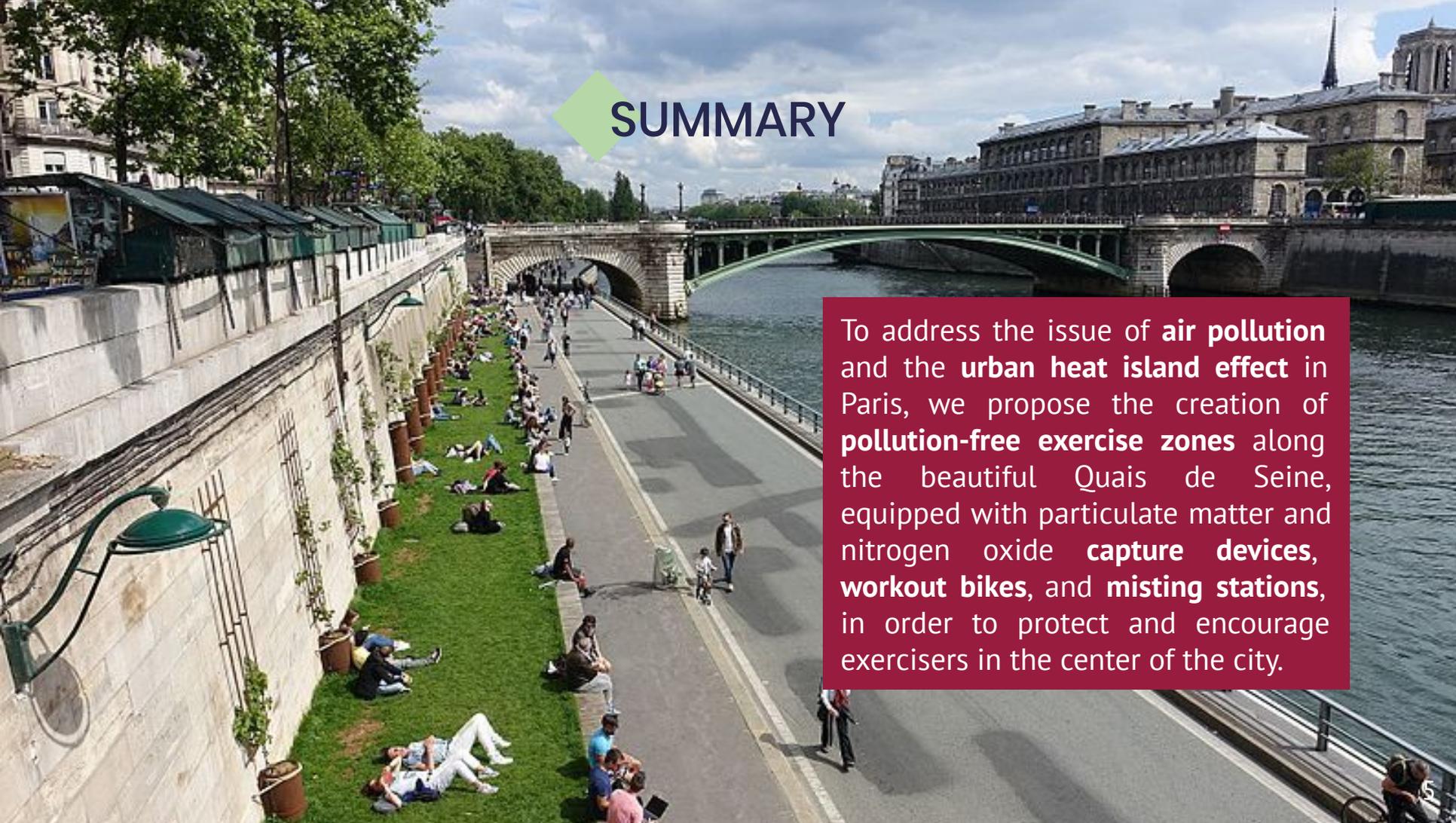
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OUR STORY

We initially attempted to address the air pollution faced by bouquinistes, the book vendors in green stalls along the Seine River. After some field work, we switched gears as the most pressing issue they faced was the competition brought about by the Internet, not air pollution. However, we still were drawn to the Seine and felt that air pollution was a worthy cause to address. We witnessed the rise of exercise culture in Paris, and we took this opportunity and came up with *PurParis*. Next time you're walking along the Seine wishing you were at *PurParis*, be sure to support a bouquiniste.

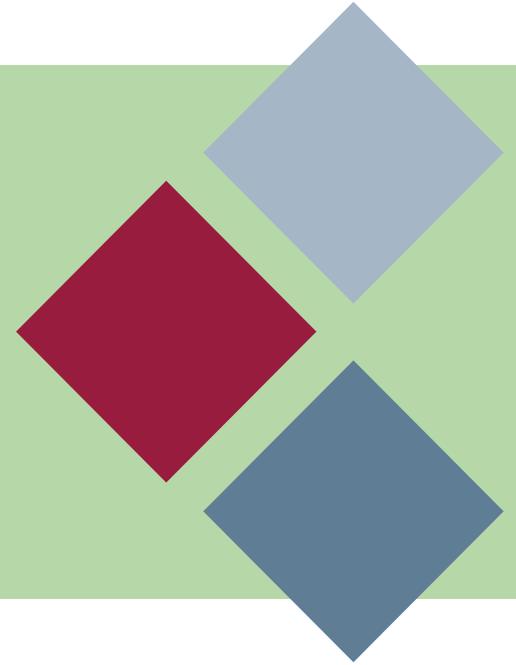


SUMMARY

To address the issue of **air pollution** and the **urban heat island effect** in Paris, we propose the creation of **pollution-free exercise zones** along the beautiful Quais de Seine, equipped with particulate matter and nitrogen oxide **capture devices**, **workout bikes**, and **misting stations**, in order to protect and encourage exercisers in the center of the city.

UNDERSTANDING THE ISSUE

The realities of air pollution and urban heat in the city of Paris, and the importance of exercise, in relation to the United Nations Sustainable Development Goals.





AIR POLLUTION

When researching the biggest problems faced by Paris, “air pollution” or “air quality” can be found at the top of lists focusing on environmental assessment. Every year, air pollution kills over 48,000 people in France, and 7,000,000 people globally (*The Local, WHO*).



URBAN HEAT ISLAND EFFECT

The center of the city can be significantly warmer than the surrounding suburbs due to the urban heat island effect. The effect intensifies as more land area is converted to blacktop and as more buildings are built as they generate and trap in more heat (*Woods*).

AIR POLLUTION STATISTICS

0.32

Paris' score out of 1 for air quality (Los Angeles scores cleaner at 0.48) (*Chazan 2016*).

183

The number of cigarettes worth of pollution that Parisians inhale every year (*The Local, 2018*).

85%

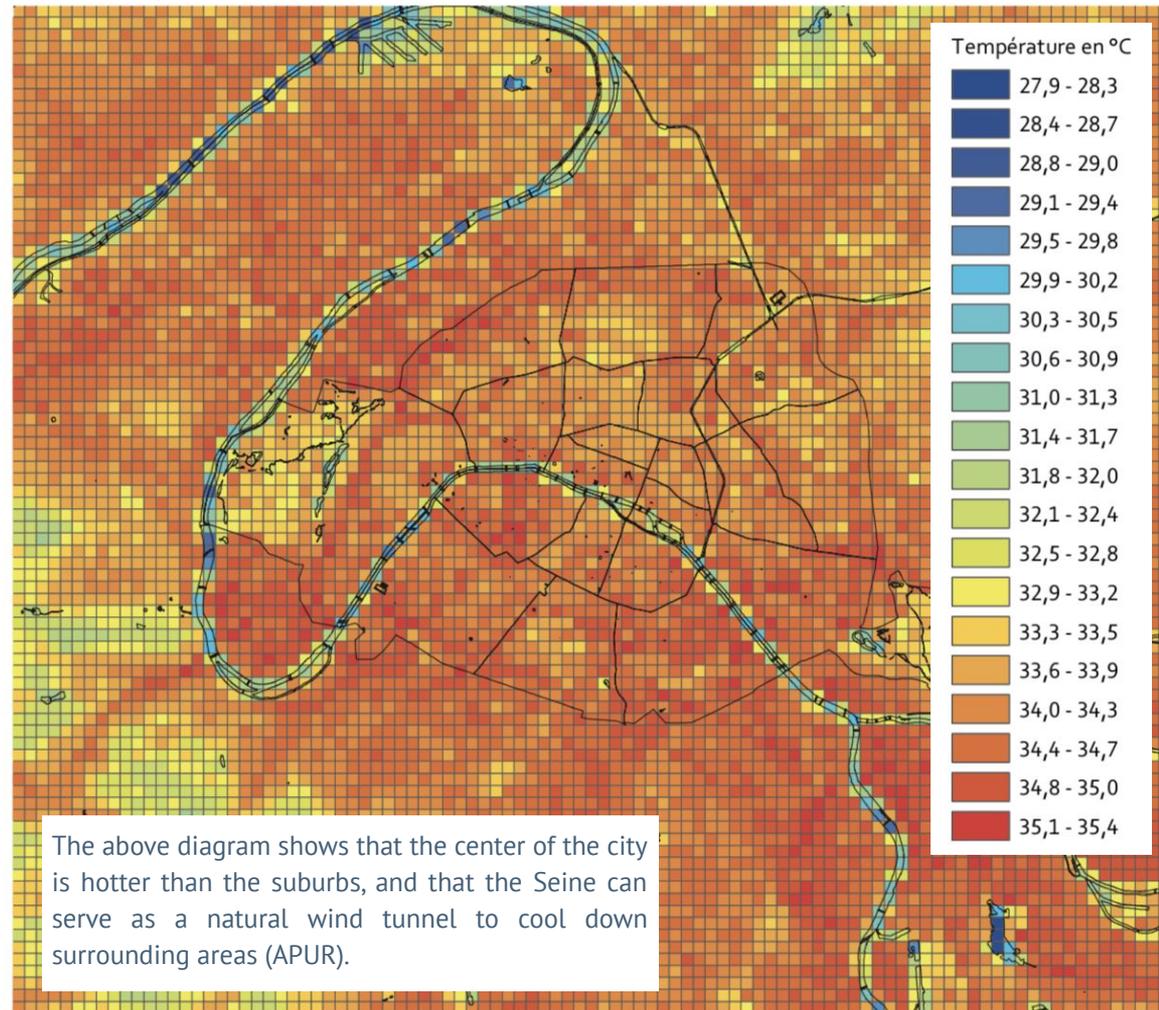
The percentage of Parisians exposed to higher-than-acceptable levels of PM 2.5 (*AirParif 2018*).

PM 2.5 is of particular concern because these particles are small enough to surpass the nasal hair and can go deep within the respiratory tract to the lungs.

URBAN HEAT ISLAND

Another factor that can discourage outdoor exercise is the fact that Paris experiences a large urban heat island effect: the phenomenon in which the center of the city is hotter than its surroundings. Within the city itself, The Paris Urbanism Agency (APUR) found that asphalt can be anywhere from 7.5 to 12 degrees Celsius hotter than nearby grass when exposed to the same levels of sunlight (*Urban Heat Islands*). Although green spaces and waterways can help cool an area down, the urban heat island effect – especially during the summer – makes for unpleasant outdoor workout conditions, which can discourage physical activity.

Figure 8 – Moyenne diurne de la température de l'air à 2 m du sol du 9 au 12 août 2003



Source : Étude EPICEA (2012)

HEALTH BENEFITS FROM EXERCISE

(Healthline)

Only
60%

of adults in France between the ages of 18-44 in 2014 “exercise[d] at sufficient levels” (WHO).



CARDIAC HEALTH

Exercise can improve stamina and increase cardiac health by lowering resting heart rate



LOWER BLOOD PRESSURE

Exercise lowers the risk of health problems including strokes and heart attacks



WEIGHT LOSS

Exercise increases one's metabolic rate, which promotes weight loss



MENTAL HEALTH

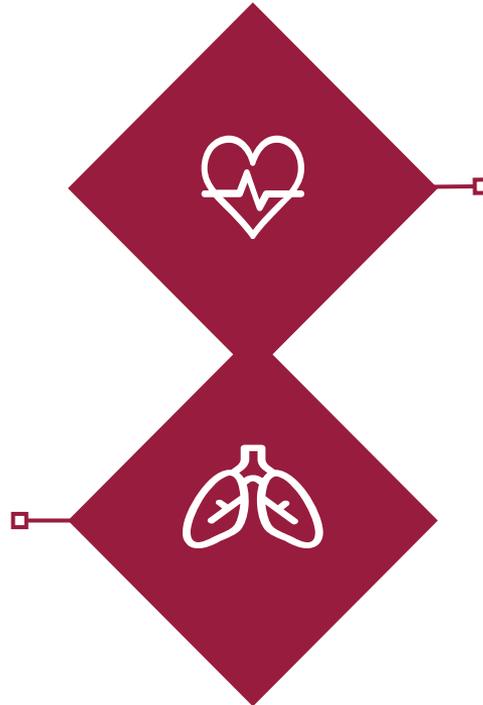
Exercise releases dopamine and serotonin, chemicals that increase happiness.

ADVERSE EFFECTS OF POLLUTION ON EXERCISE

The negatives of exercising in high pollution zones

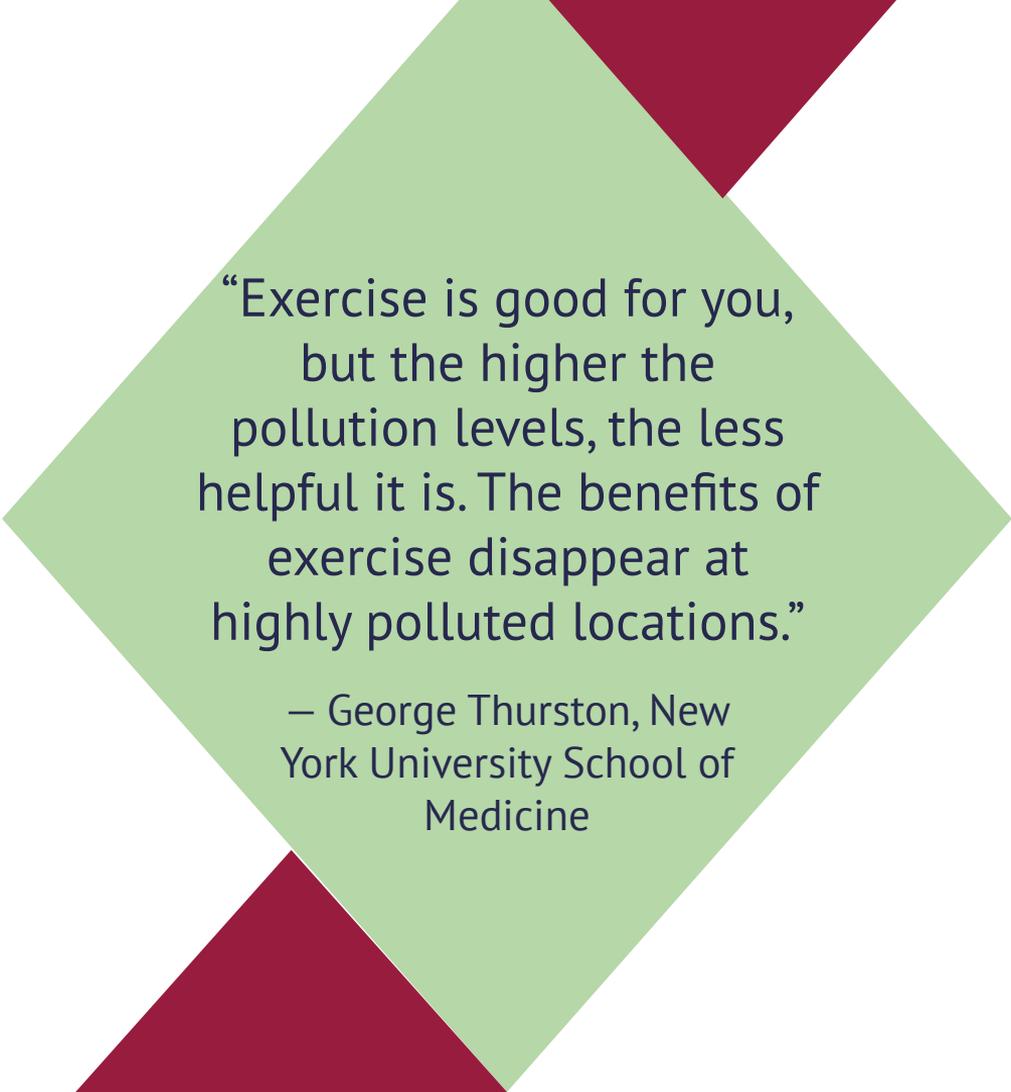
LUNG HEALTH

People take in substantially more air when they exercise, with most of it inhaled through the mouth. Because the mouth lacks the filtration abilities that the nose has (*Reynolds*), this means that **a larger amount of polluted air is able to travel deeper into the lungs** when exercising than compared to a resting state. As a result, exercising near pollution is correlated with a decrease in lung function (*Fox*). A 2017 study in London showed that a walk in a clean area of the city improved lung capacity after just one hour; a walk along the side of the road did not have this effect (*Knapton*).



CARDIOVASCULAR HEALTH

Pollutants that typically come from cars, such as fine particulate matter and nitrogen oxide, are linked with negative cardiac health outcomes. In particular, those who were exposed to these pollutants had stiffer arteries and were at higher risk of stroke or heart attack (*Fox*). For individuals already suffering from cardiovascular complications like heart disease, **the benefits to heart health that exercise provides can be counteracted by pollution**. It is recommended to these individuals – and the general population – that they exercise away from high-density traffic (*Fox*), which can be difficult in cities.



“Exercise is good for you,
but the higher the
pollution levels, the less
helpful it is. The benefits of
exercise disappear at
highly polluted locations.”

– George Thurston, New
York University School of
Medicine

SUSTAINABLE DEVELOPMENT GOALS

3 GOOD HEALTH AND WELL-BEING



OVERVIEW

Considering Paris' poor air quality and the high temperatures within the city, there is a need for green outdoor workout spaces that have safer air for Parisians to breathe. Providing such a space would inherently apply to all SDGs, but the most relevant ones are **Good Health and Well Being**, and **Sustainable Cities and Communities**.

11 SUSTAINABLE CITIES AND COMMUNITIES



SPECIFIC TARGETS

(United Nations Sustainable Development Goals)

TARGET 3.4



PurParis would *promote mental health and physical well-being* by increasing access to outdoor workout areas with clean air. Exercising in non-polluted areas has proven to offer significant health benefits.

TARGET 3.9



Our project would ideally *reduce the number of deaths and illnesses from hazardous air pollution* because if people are exposed to less-polluted air, they are likely experience decrease incidence of respiratory diseases.

TARGET 11.6



Our zones would *reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality*, because the air filtration technology we would plan on using has proven to be considerably effective.

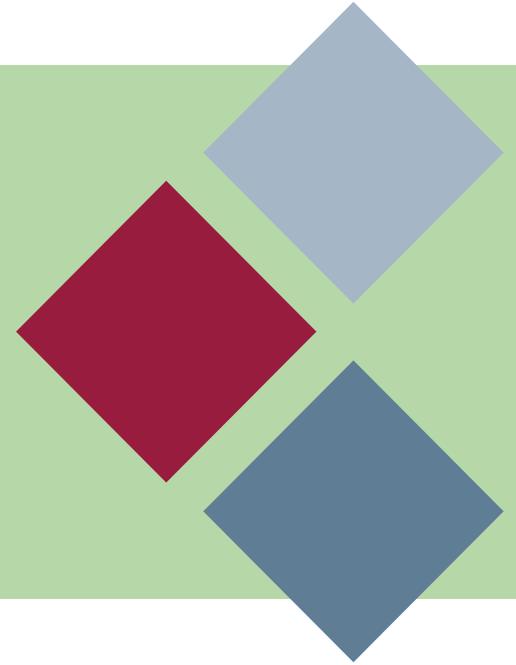
TARGET 11.7



PurParis would *increase access to “safe, inclusive and accessible, green and public spaces* because we would be incorporating grass, tress, and moss walls into our exercise zones.

HISTORICAL CONTEXT AND PREVIOUS APPROACHES

How has Paris dealt with these issues until now? Have other cities had similar experiences?



DEVELOPMENT OF THE QUAIS DE SEINE

1967

Opening of **13 km of right riverbank expressway** to cars

1992

The banks of the Seine are listed as a **world heritage site** by **UNESCO**

1994

Car traffic is reduced on two Sundays. The pedestrian and cycle paths are opened

2002

Paris Plage beach opens from mid-July to mid-August

2013

The **left riverbank expressway closed to cars**

2018

Cars are banned from all expressways due to Mayor of Paris' efforts

2019

Nature, Sport and Culture become three major themes that guide the Quais de Seine projects

ATTEMPTS IN PARIS

CAR-FREE SUNDAYS AND PEDESTRIANIZATION OF SEINE

One policy to counteract pollution was “car-free Sundays,” implemented in 2015 as part of the “Paris Respire” initiative. This initially had a small effect on air quality, but from it sprung the pedestrianization of the expressway along the Quais de Seine in 2018, which has resulted in a major shift in Parisian life by promoting exercise. **Both initiatives did not provide green spaces or combat the urban heat island effect.**



OUTDOOR EQUIPMENT

Paris currently provides locals with a range of outdoor exercise spaces such as football pitches and rugby stadiums. They are **often found near streets**, which exposes participants to air pollution, and **the spaces do little to battle air pollution.** (APUR)



SEINE OUTDOOR GYM

Near the Musee d’Orsay, there is an outdoor space along the Seine that has monkey bars and games for children. Not only is it an outdoor gym, but it also serves as a space for social gathering. **However, it lacks green spaces and air filtration systems.**



GLOBAL ATTEMPTS

OXYGYM

Oxygym in Beijing is an indoor gym with outdoor spaces, and has oxygen-emitting bars in front of exercise machines to boost the performance of participants. Although it has been popular with the community and has air purification technology, the membership is expensive and **the gym focuses on boosting oxygen concentrations in the air, not necessarily removing pollutants.** (SCMP)



INDOOR AIR FILTERS

Some indoor gyms have implemented indoor air filters to combat the high levels of carbon dioxide and particulate matter found in gyms. The market has grown exponentially within the past few years, and now there are many devices that gyms can choose from that vary in price, size, and noise level. **However, they are not meant for outdoors.**

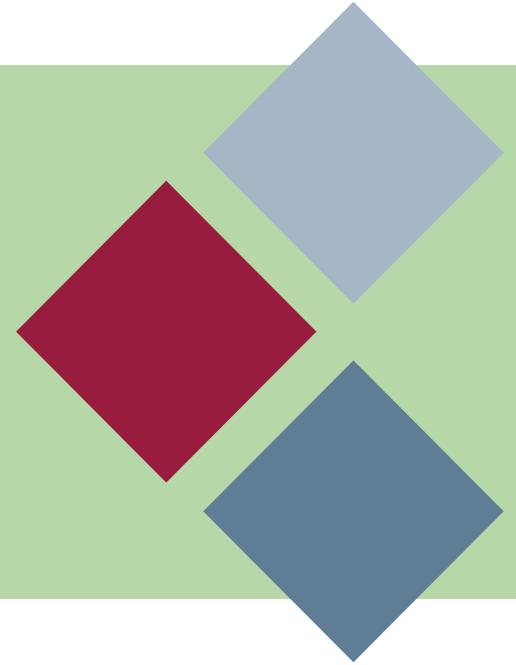
LONDON NTC

In 2017 in London, Nike brought its Nike Training Club to London, and offered free outdoor training sessions in parks. The sessions were taught by Nike master trainers and could accommodate up to 60 participants at a time. **During workouts, were exposed to air pollution as there were no air filtration devices.** (Broke in London)

PREVIOUS APPROACH	IMPROVES AIR QUALITY?	EXERCISE COMPONENT?	GREEN COMPONENT?	FREE TO USE?	OUTDOORS?
PEDESTRIANIZATION OF EXPRESSWAY	✓	✓		✓	✓
EXISTING OUTDOOR EQUIPMENT IN PARIS		✓		✓	✓
BEIJING OXYGYM	✓	✓			✓
LONDON NIKE TRAINING CENTER		✓	✓	✓	✓
SEINE OUTDOOR GYMS		✓		✓	✓

OUR SOLUTION

Laying out the fundamentals of PurParis.





OUR SOLUTION	IMPROVES AIR QUALITY?	EXERCISE COMPONENT?	GREEN COMPONENT?	FREE TO USE?	OUTDOORS?
PURPARIS	✓	✓	✓	✓	✓

VALUE PROPOSITION



We provide green, pollution-free outdoor spaces to active members of the Parisian community. Unlike traditional exercise zones, we offer spaces that combat the urban heat effect and provide improved air quality on the banks of the Seine River.

PURPARIS COMPONENTS



Pollution Capture
Devices



Workout equipment



Relaxation zone



Renewable energy

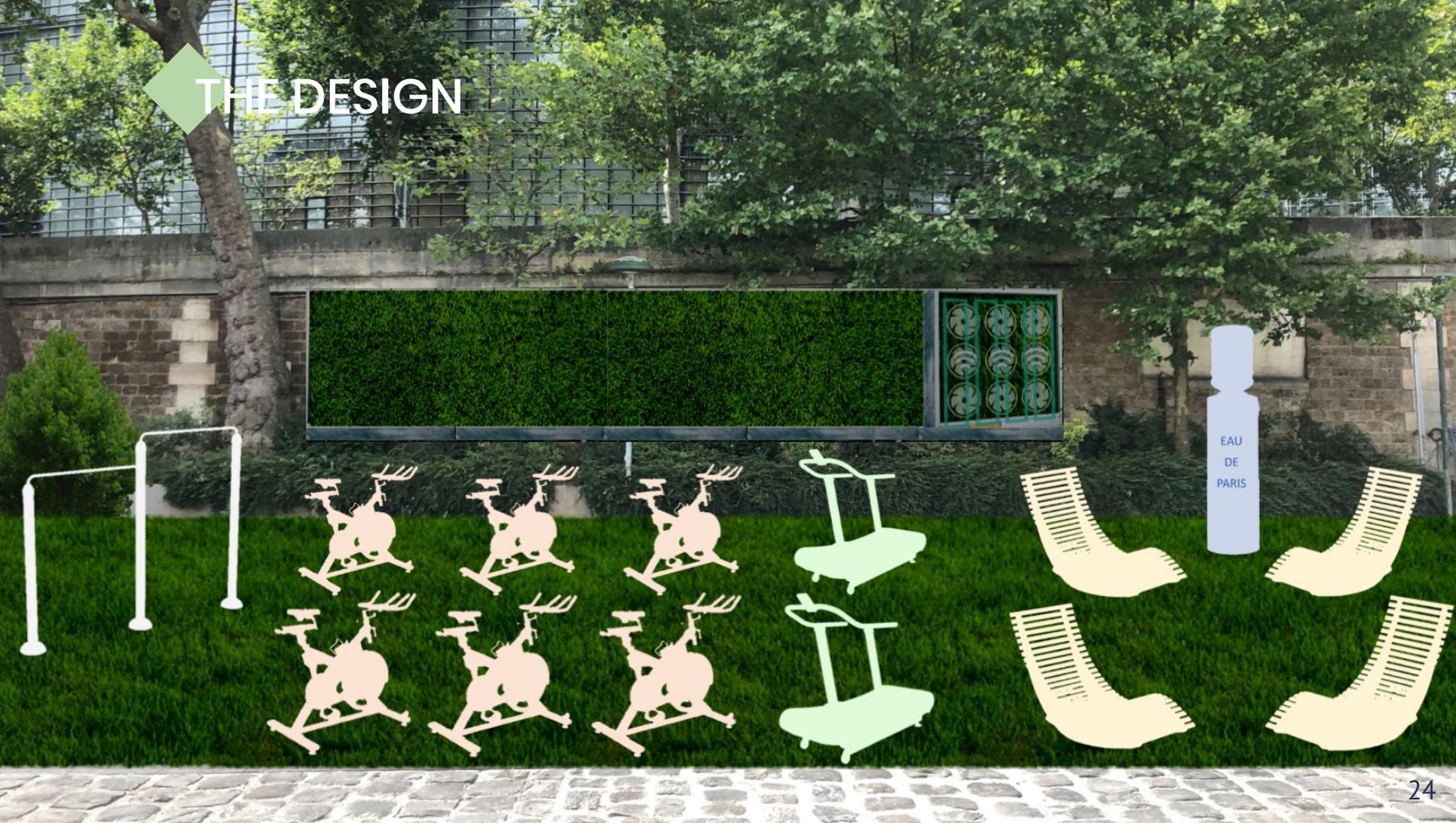


Free and open to all



Educational aspect

THE DESIGN



EAU
DE
PARIS



DETAILED EXPLANATION

We are proposing **outdoor, pollution-free exercise** spaces on pieces of land along the Seine river banks. These spaces will be **free** and **open to all**. They will have grass as ground cover and include all basic necessities for individuals to exercise aerobically and anaerobically. Within the space will be **spin bikes, manual treadmills, and pull-up bars**. Workout and spin studios will be able to rent out the space at an affordable cost at various times, but the goal is to create a flexible outdoor gym that anyone can access and utilize.



Unlike existing workout spaces, PurParis would have **air filtration devices** to purify the nearby air, so that participants can exercise outside and be safe from harmful pollutants. This project will incorporate **GreenCity Solutions** technology: moss walls that naturally filter for particulate matter and nitrogen oxides and use technology to regulate irrigation, ventilation speeds, and sun exposure. One wall will be **hung along the walls of the Seine**, and two more will be placed on adjacent sides of the space, creating a 3-sided enclosure – the open side will look along the river.



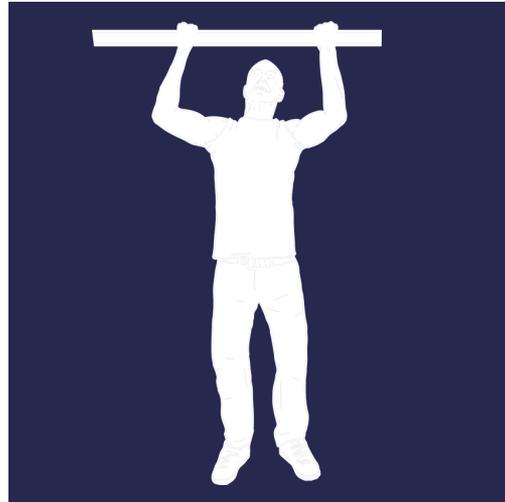
Although there has been a recent surge in outdoor gyms and innovative indoor gyms, **none are quite like PurParis.**

WORKOUT EQUIPMENT

16 spin bikes



2 pull up bar structures



4 manual treadmills





RELAXATION ZONE



Benches



Water stations



Open grass areas



Misting devices

The relaxation zone, a crucial component of PurParis, will encourage all members of the Parisian community to **enjoy the fresh air** provided within this space. Similar to a park, there will be **benches** and **swaths of grass**. **Water stations** and **misting areas**, provided by **Eau de Paris**, will help to combat the urban heat island effect. Tourists can stop on their walk for a rest along the Seine, and senior citizens can gather to reflect and catch up with friends.

In cases in which exercise studios want to **rent the PurParis space**, it will be possible to **remove the benches and create a grass-covered space** for yoga and meditation, as well as higher intensity fitness sessions and dance classes. There will be very little separating the spin bikes and relaxation zones, so if an individual overheats while exercising, they will be **able to cool down instantly**.

WHAT IS GREENCITY SOLUTIONS?

(GreenCitySolutions.de)



GreenCity Solutions is a company that provides cleaner air to cities through **moss walls** paired with Internet of Things technology to **monitor and improve air quality**. Before a device is installed, sites are evaluated using ENVI_MET® software, which uses sensors that automatically **transmit data** to the cloud. Sites are chosen based on the data, and the ideal locations are in heavily polluted and well-trafficked areas. Once installed, the condition and environmental performance of the product is monitored and **ventilation speeds can be adjusted to increase airflow**, increasing the filter effect for pollutants (PM1, PM2.5, or PM10). Data is made available on a maintenance app, and service teams care for the plants and service the technology as needed.

BENEFITS OF THE GREEN WALLS

(GreenCitySolutions.de)

GREENSPACES

The moss walls provide a large amount of greenery considering the small space.



AIR PURIFICATION

GreenCity Solutions substantially improves city air both efficiently and quantifiably.

URBAN HEAT ISLANDS

GreenCity Solutions products cool the surrounding air through water evaporation off the moss walls.



NOISE CONTROL

The walls and benches can serve as low-maintenance forms of noise control.

KEY NUMBERS

(GreenCitySolutions.de)

20-53%

The efficiency range for capturing PM1

26-64%

The efficiency range for capturing PM2.5

56-86%

The efficiency range for capturing PM10

0-8%

The range of values for deposition of nitrogen oxides (NOx)



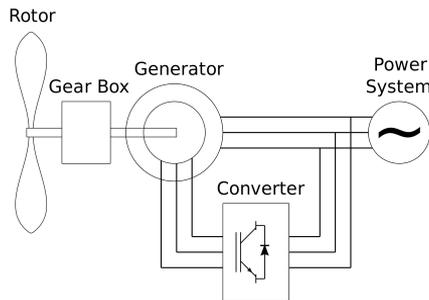
“We love the idea of PurParis to set up ‘green safe zones,’ promoting physical activity in a clean and fresh environment for the people of Paris.”

– Felix Mann, July 2019
Chief Marketing Officer
Green City Solutions

USE OF TREADMILLS AND BIKES TO POWER FILTRATION DEVICES

Sustainably powering PurParis

Energy for air purification systems is typically provided by the grid, but PurParis will use electricity **generated by the spin bikes** in order to run the capture systems. The machines only need **100 watts per hour** to power the fans, which is about how much electricity is generated from one person riding a bike in the same amount of time (“Saving”). When individuals utilize the spin bikes, they will physically spin a rotor and generate power; in doing so, they will actively purify the air around them.



We would accomplish this by using devices that **convert** bicycle rotational energy into electrical energy and spin bikes compatible with these devices. People will be incentivized to peddle faster and longer so that the devices do not have to use energy from the grid, and so that they continue to breathe purified air. Ideally, individuals are at PurParis zones so frequently that the entire initiative is grid-free and sustainable.

The devices also need a fair amount of water for the automated irrigation system. Water provision is either connected or independent. We would hope to source water from the Seine and filter it before providing it to the plants.

BENEFICIARIES

Our target audience



Active urban
professionals/ young
people



People looking for a
break from heat and
pollution



Tourists and
passerbies



People looking for a
free alternative to
traditional gyms



Individuals looking for
a social experience



Children with their
parents

POTENTIAL SPACES, MAPPED

(Stamen Maps)



Space designated by the Paris Urbanism Agency (APUR)



Other initially identified spaces fitting qualifications

POTENTIAL SPACES, PICTURED



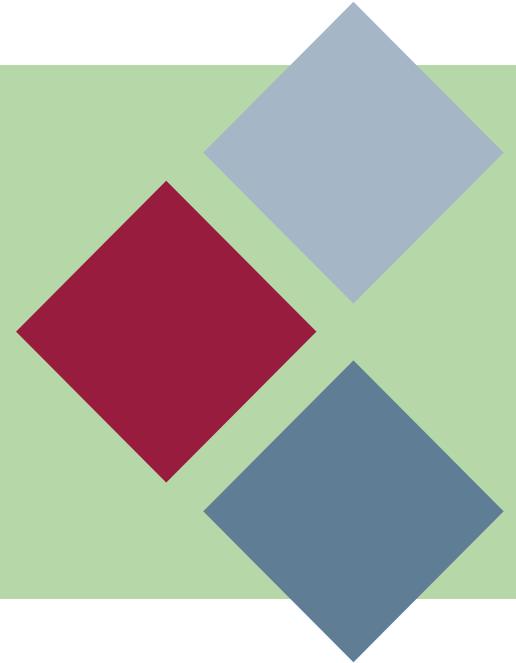
Left bank of the Seine, Pont de Sully-Morland. This is a sheltered space, with built walls along three sides and an excellent view of the Seine.

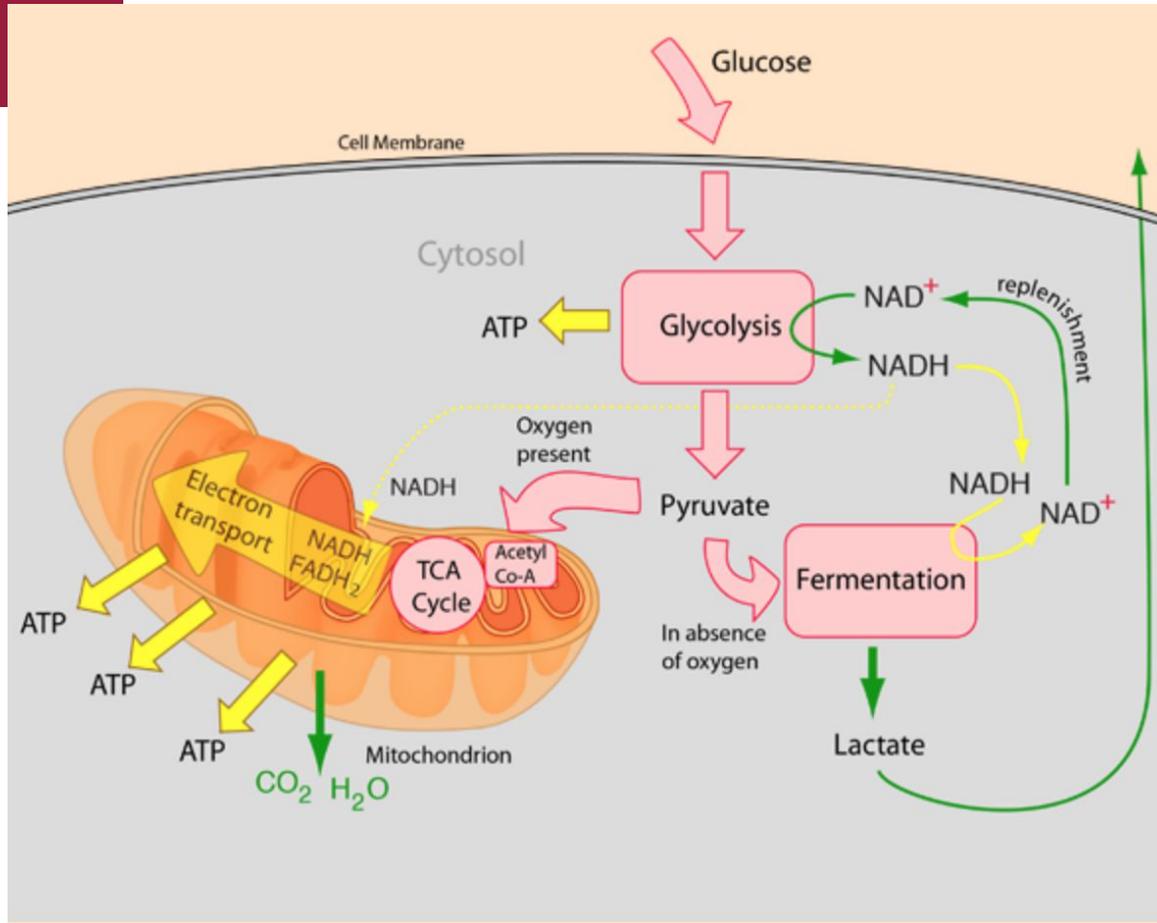


Right bank of the Seine, near the Grand Palais. This is a more open area, with a wide river bank and extended space along the wall.

BIOLOGICAL INSPIRATION

The mitochondria's role in PurParis'
design and function





THE MITOCHONDRIA

The mitochondria, also known as the powerhouse of the cell, is responsible for the production of ATP. ATP, the compound that cells use as their source of energy, is crucial to sustaining life. *(Georgia State University)*

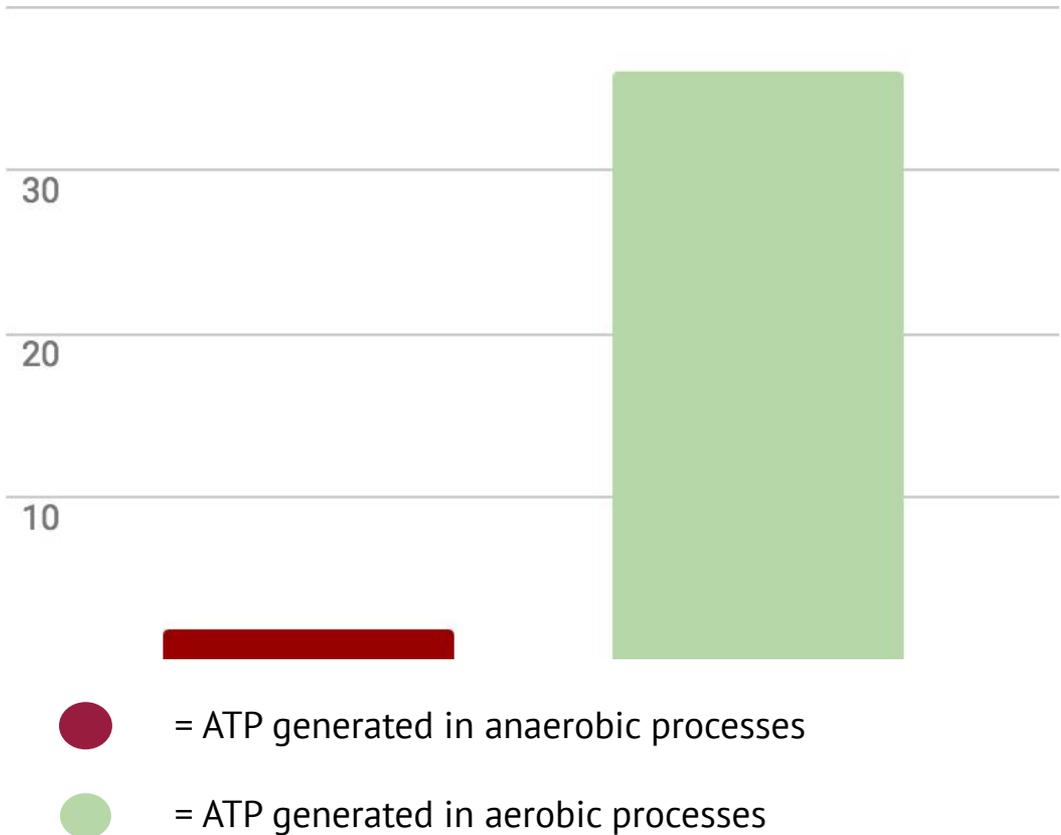
As seen in the diagram on the left, mitochondria turn glucose and oxygen into ATP, carbon dioxide, and water, in a process known as aerobic respiration.

THE IMPORTANCE OF OXYGEN

Mitochondria are able to produce far more energy aerobically, when in the presence of oxygen, than anaerobically. A mitochondria typically produces 38 molecules of ATP for every molecule of glucose, and 36 of those ATP compounds come from processes involving oxygen. (*Indiana University*)

If an organism lacks oxygen, its mitochondria cannot create enough energy to power its cells. This is why PurParis' design incorporates energy production devices to power pollution capture systems.

ATP produced over various stages of respiration



MITOCHONDRIA

Through cellular respiration, mitochondria turn glucose and oxygen into ATP, which is used to power the various activities of the organism.

With oxygen, cellular respiration works far more effectively. The cell will not be able to function properly without the presence of O₂.

As individuals age, mitochondria in cells break down; this ultimately causes the organism to become less healthy.

PURPARIS

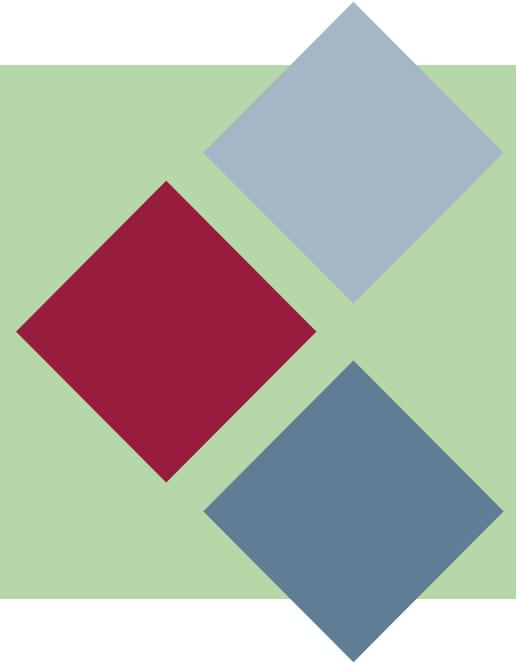
Through aerobic exercise, Parisians turn mechanical energy into electrical energy, which is used to power the various pieces of PurParis, including the green walls.

Individuals utilizing the workout space are healthier and more equipped to exercise when surrounded by clean air. In the wrong environment, exercisers cannot function.

The quality of equipment in PurParis will almost certainly depreciate over time, which is why constant maintenance, supervision, and care is needed.

PARTNERSHIPS AND FUNDING STRUCTURE

What outside organizations do we need to connect with in order to make PurParis a reality? What are our revenue streams?



PARTNERSHIPS



CORPORATE FUNDING

Corporate social responsibility trends will play a major role in devoting profits to invest in *Green City Solutions* walls and the rest of PurParis. We hope to form bonds with corporate sponsors, providing them **reputational capital in the form of environmentalism in return.**



PUBLIC ORGANIZATIONS

The project needs to be integrated in the **public development plans of the riverbanks**, with the help of city planners and urban planning organizations. We will especially be working close to *APUR*, *l'Atelier parisien d'urbanisme*.



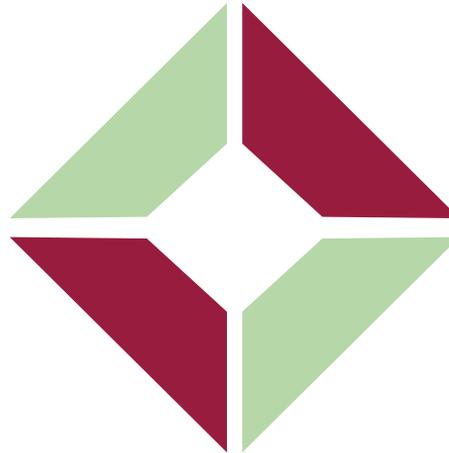
CITY HALL

The city of Paris will be a valuable partner in PurParis' development. PurParis zones are designed to be implemented in public spaces. To do so, we plan to sign a multiannual agreement for public domain occupation. **Paris will benefit from Parisians coming to the Quais de Seine**, using it as a sport space and gathering area.



GYM CENTERS

PurParis aims to **encourage community developments in green urban spaces**. To guarantee an active use of the zone, we anticipate to partner with gym centers in the city and organize events to promote the space.



FUNDING & REVENUE STREAMS

GRANTS, SPONSORSHIPS, & CROWDFUNDING

For initial implementation, we would rely on fundraising and the generosity of corporate companies.



ALLOCATION

Support from the City of Paris, particularly through the Budget Participatif, can provide the necessary funds to make PurParis possible.



RENTAL

PurParis exercise zones can be rented by gym centers or community groups to provide athletes the chance to take outdoor classes on the beautiful Quais de Seine.



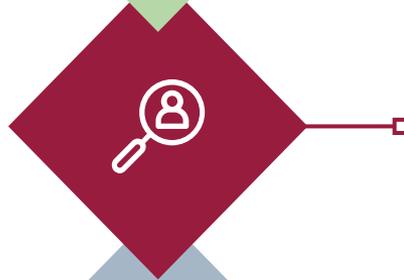
MAINTENANCE

To ensure the continued functionality and security of PurParis zones, **maintenance** will be needed once every two months during the winter and once every month the rest of the year, which means **9 inspections per year**.



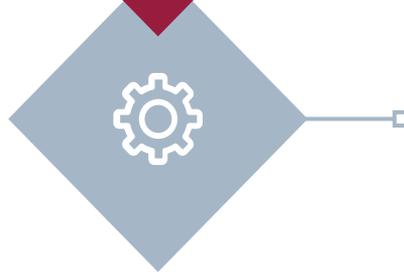
INSTALLATION

An efficient urban space requires creative installation and particular placement to enhance community. It is crucial PurParis spaces are crafted in a pleasurable and practical manner.



INSPECTION

Frequent technical inspection of the sport materials and technological systems is required in order to maintain PurParis.



CLEANING AND REPAIR

Cleaning the sport materials, taking care of the vegetation, and removing and replacing any damaged equipment will encourage individuals to return. This requires an attentive team ready to respond to issues quickly.

SOCIAL MEDIA & OUTREACH

DIGITAL CAMPAIGNS

Instagram combines images and community, and **influencers** are at the heart of new marketing strategies. Collaborations with sports influencers will allow us to inform Parisians about PurParis, build awareness, and create a desire among consumers to utilize PurParis -- for their personal health as well as the space's notoriety.

PRESS RELEASE

Our press release will include the design of our space, a description of the benefits associated with its use, as well as our digital **trailer**. This release will be **delivered to journalists and newspapers** in order to get **media coverage**.



DIRECT COMMUNICATION

Thanks to our partnerships, sport organizations and gym centers' members will be aware of the creation of PurParis. Sport facilities will be able to rent out our space, which will encourage gym-goers to visit. We also plan to directly campaign to customers through **flyers and special events**, such as free workout classes, to gain publicity.

COST ESTIMATES

Entry Cost	
Green City Solutions Technology	75,000
<i>3 Moss Walls (2x4m)</i>	
Workout Equipment	9,500
<i>16 Spin bikes</i>	5,000
<i>2 Pull up bars</i>	1,500
<i>4 Manual treadmills</i>	2,200
<i>4 Benches</i>	800
Installation	5,000
Legal Fees	10,000
Advertising	10,000
<i>Social Media Influencers, Opening Event</i>	
Recurring cost	
Yearly Maintenance	15,000
<i>Cleaning Inspection</i>	
TOTAL	124,500

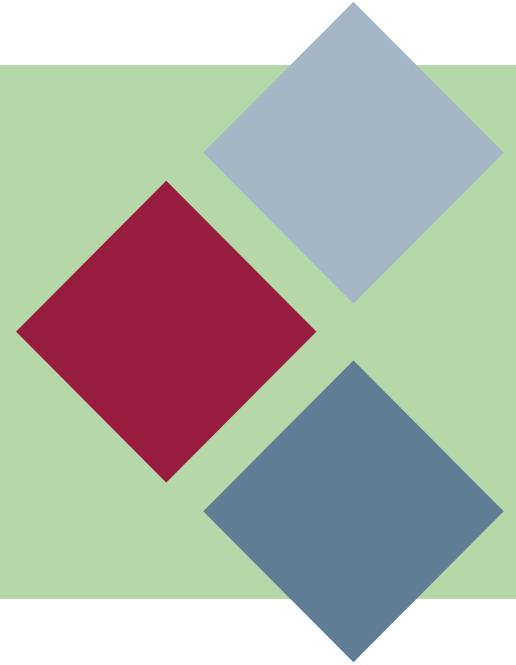
Estimated average market price of sport facilities. We aim to reduce the cost of bikes by buying reused or bikes in components. Materials for pull up bars and benches should be sustainably sourced.

Estimated based upon event planning fees and influencer rates.

Estimated cost of labor, repair, and watering of the moss walls.

ASSESSMENT PLAN & IMPLEMENTATION TIMELINE

How will we execute PurParis and gauge its success?



IMPACT

Expected impacts of PurParis

Tackle

air pollution on a given plot
of land along the Seine

Encourage

members of the Paris community
to exercise without fear of
overheating or pollution

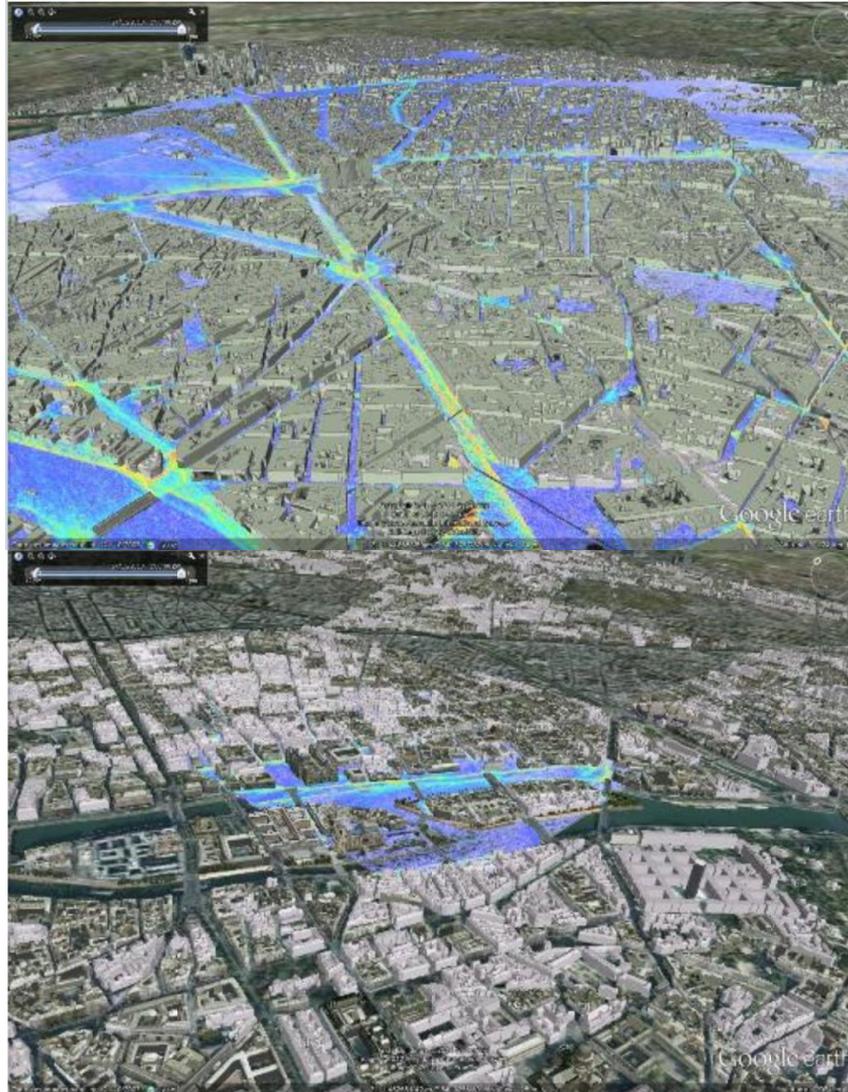
Engage

civilians to think about
healthy lifestyle choices
and environmental issues

ASSESSMENT

Measuring PurParis' effect on pollution + urban heat

We plan on partnering with ARIA, a company that creates maps and analyses of pollution concentration (NO_x, sulfate, particulate matter), temperature, and emissions in given areas of cities. We hope to use their expertise to analyze whether the area along the Seine guarded by the green walls sees a noticeable improvement. (ARIA)



This is a broad map of Paris that shows where the highest concentrations of emissions are.

This is a particular piece of the Quai de Seine, illuminated by the amount of pollution in the area.

ASSESSMENT

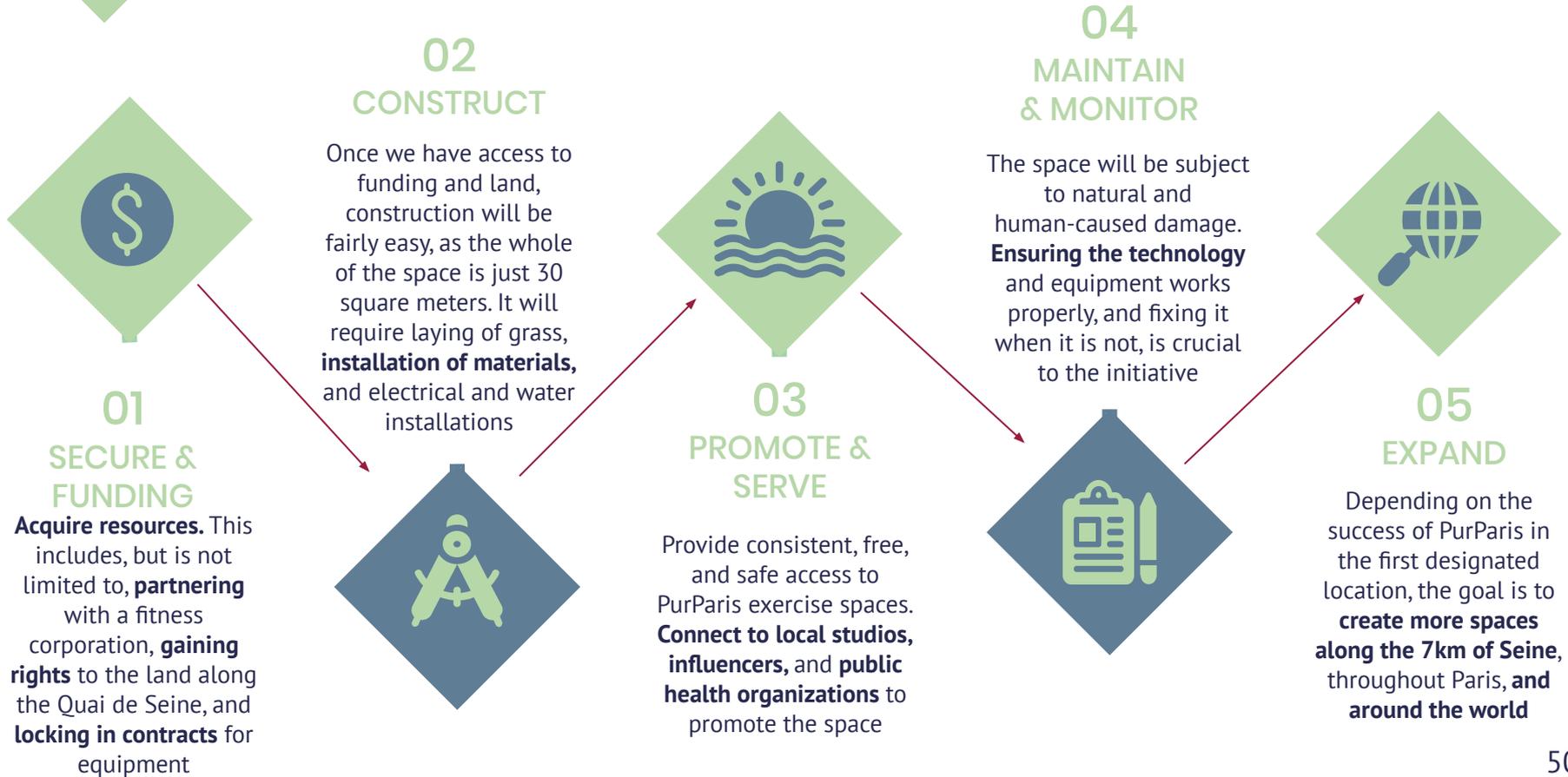
Encouraging Parisians to become active

A number of steps can be taken to track the number of individuals who use the gym, **how many miles they travel**, and **how many calories they burn**. Given that the spin bikes and treadmills will be modern devices with electronic components, **PurParis can register these statistics directly**. As for the number of guests, a turnstile system upon entering the gym might suffice, especially if the gym will already be enclosed on 3 sides by the green walls.

Engaging civilians with Sustainable Development Goals

An equally important piece of our project is that **citizens become engaged with environmental issues through different aspects of PurParis**. For one, the pollution monitoring devices publish air composition data available to visitors. Further, they will **learn how mechanical energy can be converted into electrical through the bicycle-green wall connection**. Finally a potential kids' component should aid in creating interest in air pollution and the urban heat effect from a young age.

IMPLEMENTATION TIMELINE





WITH SPECIAL THANKS TO:

The Biopolis Team

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Cofounder

Alain Viel

Cofounder

Michel Becuwe

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Teaching Fellow

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Additional Help

Felix Mann

GreenCity Solutions

Patricia Pelloux

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