CONCEPT PAPER

Country: Italy

Team members:

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SHORT DESCRIPTION OF YOUR SOLUTION ***(Maximum three sentences)***

Our project is a package of solution over a five-year term. It implicates an improvement in the Brussels' urban transport system, which will be more connected, organized and sponsored. It will also help to reduce the traffic jam, especially in the rush hour.

EXECUTIVE SUMMARY

Executive summary – very brief summary of the most important points of the Concept Paper: what will your plan deliver, why is your solution the best at meeting the selection criteria? ***(Maximum 150 words)***
Our purpose is to reduce the traffic jam and the carbon footprint of the transport system in Brussels-Capital city: this can happen thanks to Brumsels. Brumsels is the entire project we came up with; it provides an application (which organizes the public transports), the installation of a new technology inside trams (supercapacitor) and the placing of two new types of vehicles in the inner-city network (Podbikes and electric buses). The features we offer take into consideration the average age of Brussels' population, which is around 37 years[1]. The cost of the whole project will be about 36.200.000 euros and it will be repaid in less than 3 years. In the following years there will be a profit of 14.000.000 euros per year. In the five year time the CO_2 emissions will be reduced of 68.170 tons, which is 30% less than the actual emissions.

SOLUTION

Detailed description of your solution (design/function, features/benefits, creativity/innovation) ***(Maximum 150 words)***
First of all, we will develop an application which includes all the transportation methods in the city. Moreover, by inserting a booking system for the shared vehicles and by having a personalized profile based on one's needs and interests, the application will track the best and fastest route. Eventually, users can accumulate discount vouchers for centers of interest belonging to the initiative, like cinemas, restaurants, etc. During the first year, we will introduce a new type of vehicle (Podbikes) in our already existing sharing system. Over a three years-term, we plan to applicate the supercapacitor technology to the trams. We will also substitute half of the public buses with electrical ones: these buses connect the urban area with the city center, where sharing stations with 10 bikes each (both kinds) are available. The last action will be banning non-electrical vehicles within the zone limited by the tube line number two.

[1] https://ugeo.urbistat.com/AdminStat/en/be/demografia/dati-sintesi/province-de-bruxelles/21000/3

Impact of your solution – use your Science-Technology-Engineering-Math skills to estimate or calculate the impact of your solution. Explain why your solution is the best plan for upgrading and modernizing the inner-city transport network of Brussels. ***(Maximum 250 words)***
CO_2 emissions produced by tram: Emissions = 1 g/km[2]* 60.000 km per year = 60 kg per year. The supercapacitor system reduces the usage by 25% (15 kg/year). We have 200 tram units=9 tons per year instead of 12. *3 tons CO_2 less per year.* **CO_2 emissions produced by bus:** On average emissions produced by each bus: 180 g/km. On average a bus covers 60.000 km. Emissions: 180 g/km * 60.000 km = 10,8 tons per year each bus. We have 100 bus units=1.080 tons per year. Electric bus reduces CO_2 emissions by 50%. *540 tons CO_2 less per year.* **CO_2 emissions produced by cars:** On average emissions produced by one car: 118 g/km. On average a car covers 9900 km (66% of 15.000[3]) in the city. Emissions: 118 g/km * 9900 km per year= 1,2 tons per year (each car). We have 193.000 cars, so the total emissions are 193.000*1,2= 225.424 tons. 25% cars reduced by banning cars from downtown and 5% substituted by bike sharing and more efficient public transport: We have 135.100 cars, so the total emissions are 135.100*1,2=157.797 tons per year. *67.627 tons of CO_2 less per year.* **Total reduce of emissions** 68.170 tons/year starting from the third year.

FEASIBILITY

Uniqueness – compared to other solutions: what is special about yours? Why should the jury select your solution? ***(Maximum 150 words)***
Our project provides a more efficient organization of public services, especially by exploiting innovative technologies and vehicles that currently are not present on the market, such as Podbikes. Furthermore, the fact that these vehicles are included in a state-funded sharing system will make the whole service affordable to everyone. In addition, the advertising inserts inside the app will serve to balance the costs of the application and his server. Brumsels doesn't drastically change the already existing transport system, but it optimizes and improves the current ways to move around the city. All of the changes of our solution are gradually integrated during the five years, so they can be easily accepted by the citizens.

[2] https://www.delijn.be/nl/
[3] https://www.statista.com/

Technology - What technology or scientific knowledge does your solution require? ***(Maximum 150 words)***

Brumsels application: advanced user-friendly interface that allows you to get up-to-date information of timetables (tram, subway, bus), weather and traffic. It allows to book shared vehicles (cars, bikes, Podbikes), suggests you the best route according to your habits (profiling cookies).

Podbikes[4]: 4-wheel assisted vehicles, to carry a maximum of 2 people. Electric and without the need for recharging, they reach 25 km/h with an autonomy of up to 100 km. Being covered vehicles, they provide protection from rain or other atmospheric agents that a normal bicycle couldn't handle.

Supercapacitor[5]: system that exploits braking energy recovery and transforms it from kinetic energy to electricity. Adding this innovation, the already existing trams will be able to increase their efficiency by 25%.

Electric motor: transforms the electric energy (accumulated in a battery and converted from direct current into alternating current through an inverter) into mechanical energy, necessary to make the car move. Batteries must be recharged.

[4] www.podbikes.com
[5] https://en.wikipedia.org/wiki/supercapacitor

Economy - use your Science-Technology-Engineering-Math and Economic skills to estimate or calculate the cost of your solution. Explain why your solution is inclusive and affordable. ***(Maximum 250 words)***

Initial situation

Daily ticket cost[6]: 7,50 euros.
Monthly ticket cost: 49 euros.
Annual ticket cost: 499 euros.
People who drive a car: 32% (384.000).
Number of Brussels' travelers: 360.000.
Number of tourists: 3.000.000/year.

Our solution

We thought about increasing the price of all the types of tickets by 6,6%, adding the possibility to use the Podbike and bike's sharing and also offering a smarter organization of all the transports. Moreover, 100 new electrical buses will be inserted in circulation.

New increased prices (our estimate):
Daily ticket cost: 8 euros.
Monthly ticket cost: 52 euros.
Annual ticket cost: 529 euros.
People who drive a car: 22,4% (270.000).
Number of Brussels' travelers: 550.000
Number of tourists: 3.000.000/year.

Gross Profit (in three years): 33.120.000 (from Brussels' travelers) + 9.000.000 (from tourists) = 42.120.000 euros.
Cost of 200 Podbikes: 900.000 euros.
Cost of 100 electrical buses: 35.000.000 (medium cost of this type of bus=350.000 euros).
Cost of 200 super capacitors for the trams: 240.000 euros.

Net profit: 5.980.000 euros in three years
Net profit in 5 years: 34.060.000 euros

The cost of the development of the application (around 50.000 euros) will be covered fast thanks to the advertisements on the app and on the vehicles. Some of the profit we will gain during the five years will be used to improve the application, for the updates and for the cost of the servers.

[6] www.stib.mivb.be

Sitography:

- https://www.brussels.info/
- https://www.eitdigital.eu/newsroom/blog/article/supercapacitor-tram
- https://corporate.exxonmobil.com/energy-and-environment/energy-resources/outlook-for-energy
- https://www.stib-mivb.be/abon_tickets.html?l=en
- https://www.evlist.it/it/mezzi-di-trasporto/podbike-dal-2019-in-italia