

## KernetCity – IT Model of Business Concept that Reduces Motor Vehicle Traffic in Cities

### Introduction

The **history of the scientific discovery of climate change** began in the early 1800s when **natural changes in paleoclimate** were first suspected and the natural **greenhouse effect** first quantified. In the late 1800s, scientists first argued that human emissions of greenhouse gases could change the climate, but the calculations were disputed. In the 1950s and 1960s, scientists increasingly thought that human activity could change the climate on a timescale of decades, but were unsure whether the net impact would be to warm or cool the climate. During the 1970s, scientific opinion increasingly favored the warming viewpoint. In the 1980s the consensus position formed that human activity was in the process of warming the climate, leading to the beginning of the modern period of climate change science summarized by the Intergovernmental Panel on Climate Change.

Beginning in 1864, Scottish geologist **James Croll** theorized that changes in earth's orbit could trigger cycles of ice ages by changing the total amount of winter sunlight in the high latitudes. His theory was widely discussed but not accepted. Serbian geophysicist **Milutin Milanković** substantially revised the theory in 1941 with the publication of *Kanon der Erdbestrahlung und seine Anwendung auf das Eiszeitenproblem* (Canon of Insolation of the Earth and Its Application to the Problem of the Ice Ages). Milanković's ideas became the consensus position in the 1970s, when ocean sediment dating matched the prediction of 100,000 year ice-age cycles.

Milankovitch studied climate records, noting differences over time. He theorized that global climate change was brought about by regular changes in Earth's axis, tilt, and orbit that altered the planet's relationship to the Sun, triggering ice ages. Earth doesn't rotate perfectly like a wheel about an axis; it spins like a wobbling top. Every 22,000 years, Milankovitch calculated, there is a slight change in its wobble. Every 100,000 years, there is a change in Earth's orbit about the Sun. Its almost circular orbit becomes more elliptical, taking Earth farther from the Sun. And finally, Milankovitch discovered, every 41,000 years there is a change in the tilt of the planet's axis, moving either the Northern or Southern Hemisphere farther from the Sun. These cycles mean that at certain times there is less sunshine hitting Earth, so there is less melting of snow and ice. Instead of melting, these cold expanses of frozen water grow. The snow and ice last longer and, over many seasons, begin to accumulate. Snow reflects some sunlight back into space, which also contributes to cooling. Temperatures drop, and glaciers begin to advance. **Milankovitch Theory** describes the collective effects of changes in the Earth's movements upon its climate.

The Milankovitch theory of climate change is not perfectly worked out; in particular, the largest observed response is at the 100,000-year timescale, but the forcing is apparently small at this scale, in regard to the ice ages. Various feedbacks (from carbon dioxide, or from ice sheet dynamics) are invoked to explain this discrepancy.

### **The Kyoto Protocol**

**The Kyoto Protocol** is an international agreement linked to the United Nations Framework Convention on Climate Change. It was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005 when Russia ratified it. 184 Parties of the Convention have ratified its Protocol to date. Republic of Serbia ratified it on 24 September 2007. The major distinction between the Protocol and the Convention is that while the Convention **encouraged** industrialised countries to stabilize GHG emissions, the Protocol **commits** them to do so.

Recognizing that developed countries are principally responsible for the current high levels of GHG emissions in the atmosphere as a result of more than 150 years of industrial

activity, the Protocol places a heavier burden on developed nations under the principle of “common but differentiated responsibilities.” It is generally seen as an important first step towards a truly global emission reduction regime that will stabilize GHG emissions, and provides the essential architecture for any future international agreement on climate change.

The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas (GHG) emissions. These amount to an average of five per cent against 1990 levels over the five-year period 2008-2012.



Figure 1: *Kyoto Protocol participation map 2009* (<http://www.sr.wikipedia.org>)

**The developed countries commit themselves to reducing their collective emissions of six key greenhouse gases by at least 5%.** This group target will be achieved through cuts of 8% by Switzerland, most Central and East European states, and the European Union (the EU will meet its target by distributing different rates among its member states); 7% by the US; and 6% by Canada, Hungary, Japan, and Poland. Russia, New Zealand, and Ukraine are to stabilize their emissions, while Norway may increase emissions by up to 1%, Australia by up to 8%, and Iceland 10%. The six gases are to be combined in a "basket", with reductions in individual gases translated into "CO<sub>2</sub> equivalents" that are then added up to produce a single figure.

**Countries have a certain degree of flexibility in how they make and measure their emissions reductions.** In particular, an international "emissions trading" regime is established allowing industrialized countries to buy and sell emissions credits amongst themselves. They will also be able to acquire "emission reduction units" by financing certain kinds of projects in other developed countries through a mechanism known as Joint Implementation. In addition, a "Clean Development Mechanism" for promoting sustainable development enables industrialized countries to finance emissions-reduction projects in developing countries and receive credit for doing so.

### ***The Masdar Initiative***

It is an environmental urban ambition by **Foster+Partners** to develop a sustainable city. One goal: "Masdar will be the first city where carbon emissions are zero." In Abu Dhabi, there's an area of nothing but wind-swept desert. But 10 years from now, if all goes according to plan, a city of 6 square kilometers housing 50,000 people will rise in the United Arab Emirates — and it will be carbon neutral.

They recently released these beautiful images of their conceptual walled city where residents would enjoy a carbon and waste-free environment. The 6 million square metre project is based on the principles of an ancient walled city, combined with modern alternative energy technologies. The mixed-use, high density city will include a University, Innovation Center, Company Headquarters and several economic zones. The initiative is being driven by the Abu Dhabi Future Energy Company.



*Figure 2: The future site of Masdar City is currently just an expanse of desert.*  
(<http://www.fosterandpartners.com>)

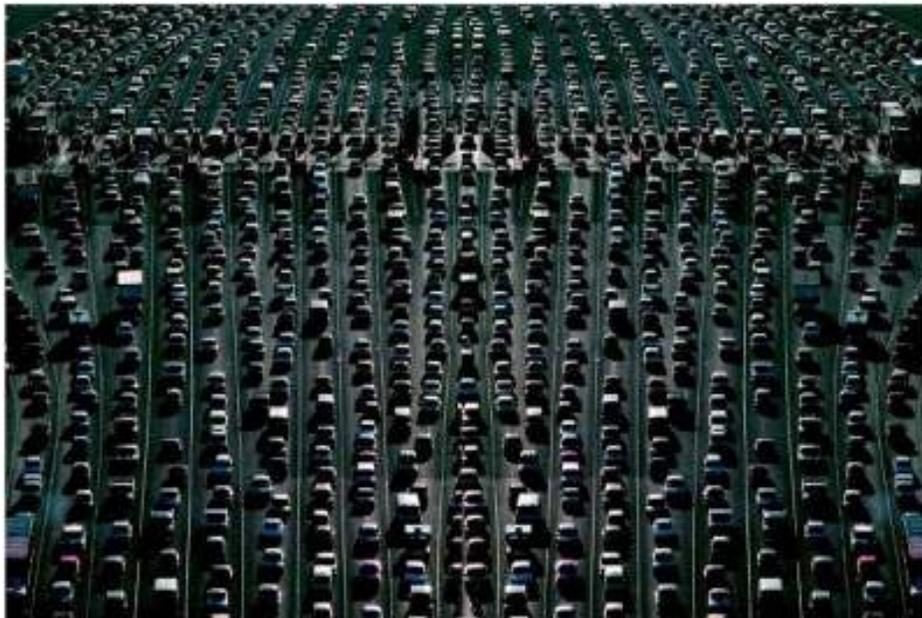


*Figure 3: The project called Masdar City*  
(<http://www.fosterandpartners.com>)

### Another option: KornetCity – IT model of a City

#### *Question*

**How to solve the problem of existing capacity overload, not because existing capacities are small, but on the contrary, because they are enormous and still insufficient?**



*Figure 4: Illustration of motor vehicle scale (M. Dimitrijevic)*

Motor traffic is gigantic. Human beings have the need for moving and until we reach technical level of development that will enable us to teleport ourselves, we will have problems with transportation systems and vehicles. Our circulation throughout the city is very complex. If the total circulation was presented on the flux chart, home-work-home commuting would be easiest to track (number of commuters, rush hours, jamming points, etc.).

Of all home-work-home commuting that belonging to people employed in tertiary services using computers as their main working tool would be most constant and therefore easiest to define.

The premise on which this paper is based is that people who do their work using computers are **not** conditioned by their location. They can perform well whether they are working in their office, at home or any other place.

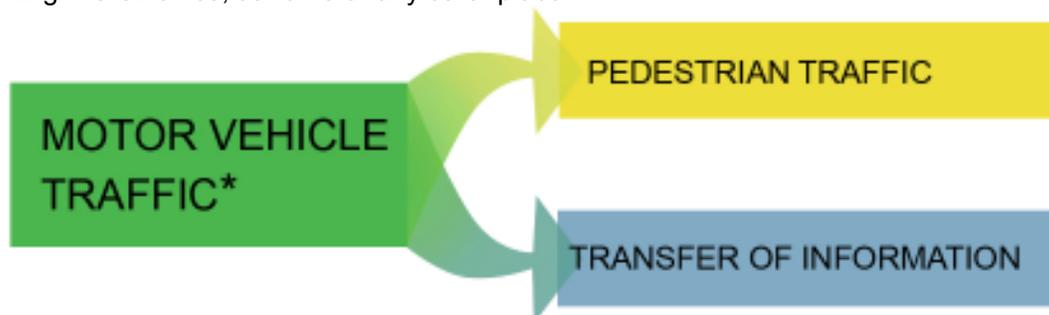


Figure 5: **Illustration of potential of motor vehicle transformation** Passenger's motor vehicle traffic that exists in the purpose of transporting working population from home to work and from work to home who are working in:

- Tertiary sector
- Their main tool is computer (M. Dimitrijevic)

### **Working in the traditional office vs. working at home**

Huge number of people moving in the same direction to get to work inevitably creates traffic jams. Conventional ways of dealing with this problem are:

- Increase of the road capacity
- Joining together business and residential activities.

Today working at home is possible by using an array of technical devices that are easily accessible. Cisco is an example of a world known company that produces devices for Telepresence, Teleworking, etc. Cisco's initiative called TELEWORKER allowed 2000 workers to work from home and resulted in 227 million USD company cuts on office costs.

Key results were saying that 83% of participants in the research said that their ability to communicate and cooperate with colleagues stayed the same while they were working out of the office and that they also saved the emission of 47.320 metric tons of gas that creates the glass house effect just by avoiding travelling to work.

Today about 96% of workers in Europe are employed in Small and Medium Size Enterprises (SME). Their ability to use technical devices from home might not be as high as that of Cisco workers. Other factors that might reduce the quality of work at home are the adequate working space inside worker's home and necessary hardware and software requirements. This can be an expensive solution for some people and companies.



Figure 6: **Space demand for working at home** (M. Dimitrijevic)

## **KornetCity**

KornetCity is an attempt to connect the best characteristics of work in the office and that of work from home. Target group of the project are citizens employed in tertiary sector who have jobs that have to/can be executed through computer.

KornetCity concept is based on the following:

**Kornet is a specific office building. These buildings should be spread all over the city at the distance of up to 1,6km. This distance is allowing that the area of gravity (for Target group) of each Kornet is up to 800m, which represents the 10-minute-walking-distance. This “time distance” is stimulating people to walk instead to take a ride in a motor vehicle.**



Figure 7: “10-Minute-Walking-Distance” as an area of gravity of Kornet buildings (M. Dimitrijevic)

Kornet building is specific because one can rent a working space or an office – NETCELL that has all necessary software, hardware and Internet connection and has sufficient information flow for conference connection to perform without interruption.



Figure 8: Telecommuting from NetCells in Kornet buildings (M. Dimitrijevic)

This means that a Company could be assembled of workers from all around the world. They have the possibility to have frequent, undistracted, and high quality communication and an office at only 10min. walking distance from their own home.

One of the services which Kernet building should provide is a possibility of renting software per usage - i.e., “you pay exactly what you use”. This enables the usage of **any kind of software** with a certain fee. This way software would become economical and legally more accessible which would improve the level of informatics literacy of the population.

### ***Phases of KernetCity implementation***

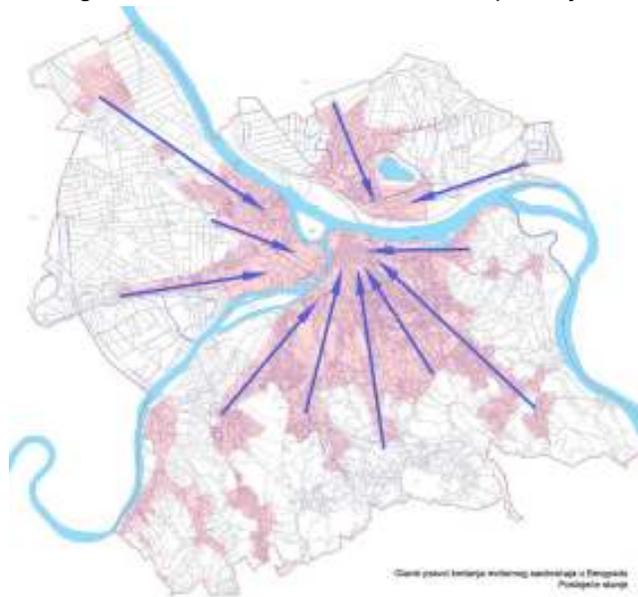
KernetCity is proposed as **the business system** which has the reducing effect of motor vehicle traffic. On a local level it is represented by the office building in the center of the settlement; where individuals or companies can rent an office space.

The benefits that users of a Kernet have are:

1. All the necessary working conditions are provided in the local Kernet building
2. Users' job is maximum 10 minutes walk away from their house.

### ***Example of the city of Belgrade, Serbia (1.5 million inhabitants):***

The proposed phases of KernetCity implementation are based upon a few characteristics which generate the “traffic that is one step away from collapsing”.



***Figure 9: Present condition – Mail directions of a motor vehicle in Belgrade (M. Dimitrijevic)***

- “Star structure” of main corridors in Belgrade and the absence of ring roads that could reduce the pressure of motor vehicle traffic in the center of the city.
- With more than 160km of river bank length, two wide rivers and just a few bridges, the existing bridges have been representing the “bottle necks” of traffic for ages.
- Belgrade does not have a metro system, so all vehicle flow has to be performed on the ground level.
- Public transportation in the city is insufficient.
- Parking system is not well defined and small in capacity
- Street system is not convenient for contemporary needs.

“Star structure” of the corridors is forcing everyone to go through the center of the city, no matter where their starting and destination points are.

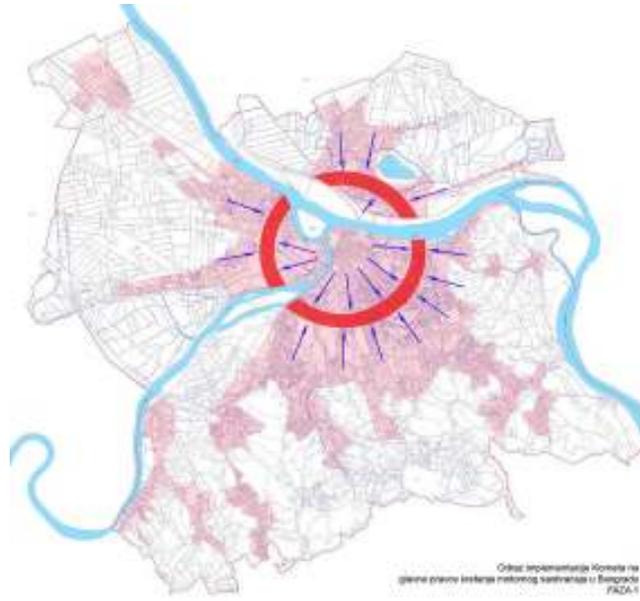


Figure 10: **Phase 1 of KornetCity implementation and the effect of the concept on main directions of motor vehicle traffic in Belgrade, Serbia** (M. Dimitrijevic)

**Phase 1:** Red Ring Zone (RRZ) is the area surrounding the border of the core city centre. The beginning of development of KornetCity is set in RRZ for several reasons:

- Residential zones that are placed in this RRZ are highly populated, meaning that there are a lot of potential users of KornetCity.
- Kornet developed in RRZ is **closer** to users living in the suburbs and also to potential users in the central areas.
- Land value in those zones varies, but is lower than the land value in the City located in the New Belgrade.
- There is a certain number of office/commercial real estates in RRZ that rapidly lost their market value and could be easily transformed in Kornet.

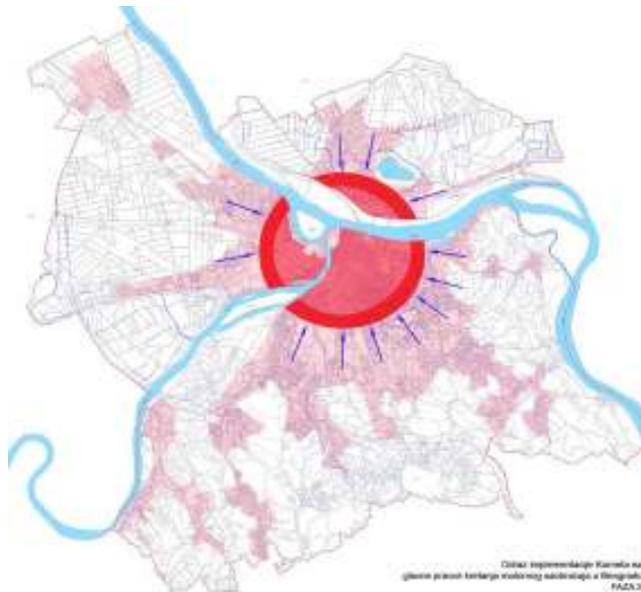


Figure 11: **Phase 2 of KornetCity implementation and the effect of the concept on main directions of motor vehicle traffic in Belgrade, Serbia** (M. Dimitrijevic)

**Phase 2 :** Dispersion of Kornet buildings throughout the wide city centre would mean the increase of “employed pedestrians” in areas with high density population. The users of Kornet from suburb areas would still be arriving to the city in motor vehicles but would have to pass app. 50% shorter distances than in present condition.

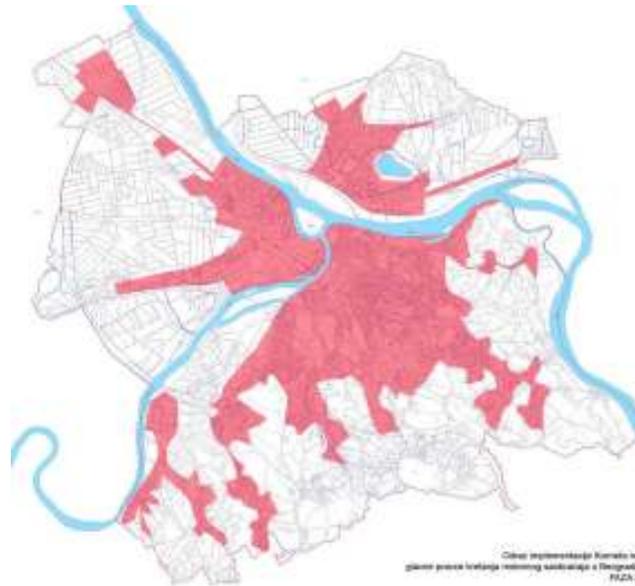


Figure 12: Phase 3 of KornetCity implementation and the effect of the concept on main directions of motor vehicle traffic in Belgrade, Serbia (M. Dimitrijevic)

**Phase 3:** The application of KornetCity concept on the entire city area. As the consequence of that, the motor vehicle traffic would be inhibited.

### Parameters

Projection for Belgrade in 2021 shows the following:

- Belgrade population 1.400.000 inhabitants
- Employed population 545.000 people
- Working in tertiary sector 73,55% (Group A) 400.850 people
- Number of travels in Belgrade (B number) 3.500.000 travels per day
- Number of travels for business purpose is 16% of B number 530.000 travels per day

The transportation devices used to go to work in Belgrade

- Private car – 24,75%
- Public transportation – 59,07%
- By foot – 13,87%
- Other ways of transportation 2,31%

Potential effects of KornetCity on passengers motor vehicle traffic (PMVT)

- 83,82% of Group A uses motor vehicle traffic to go to work (Group A1) 336.000 people
- Assumption that around 40% of Group A1 might perform their work in Kornet (Group A1.1) 135.000 people
- This indicates that the reduction in MVC might be influenced with 135.000 users that generate around 270.000 travels (by PMVT) per day.

**Based on these figures comes the conclusion that by applying KornetCity system in Belgrade, the City may reduce the number of participants in passenger’s motor vehicle traffic for almost 8%.**

## Kornet Building

Schematic appearance of Kornet building exposes difference from traditional office building in **the level of integrity of ICT installations**. Still, the most significant difference of Kornet buildings is the **absence of garage areas or parking places**.

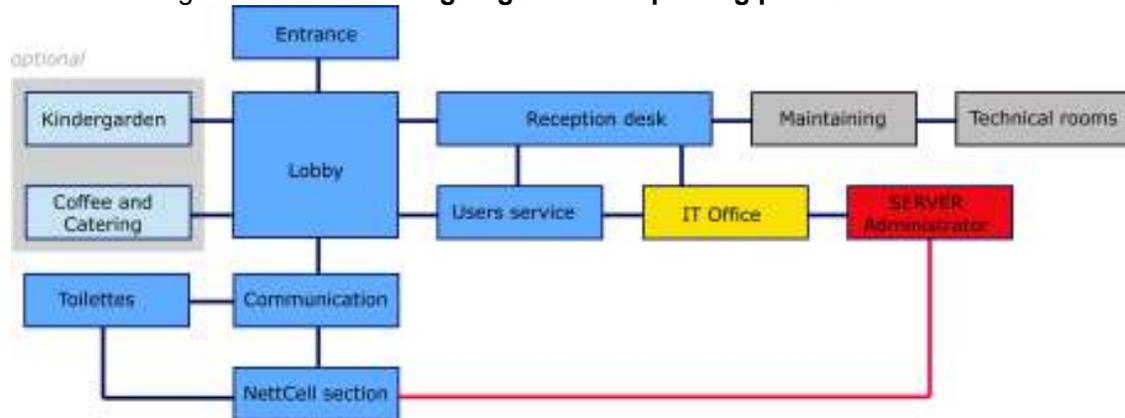


Figure 13: **Schematic presentation of Kornet building organization** (M. Dimitrijevic)

## Business

KornetCity should be acceptable and **convenient for small and middle size businesses SME**, especially for startup investments.

Example: When you are starting your own business, i.e. Architectural studio, you are starting with the idea that the scope of work will increase and that at certain point, you will have to employ new employees.

So you buy or rent work space.

1. The space is usually bigger than current company needs (but with a assumption that the company will expand). This means that from the start, Company is paying 150%, 200% or 300% more than it actually needs.
2. The same applies to hardware and software. First one needs to buy a computer, network, printer, plotter, Word, Excel, AutoCAD, etc. and then starts to work.
3. Start up investments exceed real needs of the Company but the entrepreneur has no guarantee that the business will succeed.

Inside Kornet things are done differently:

**Company rents only the space it needs for currently employed people which provides the start up usage of 100%**. No matter if the number of employees is increasing or decreasing, this does not require change of company's residency and increased investments in office space. Hardware and software is always 100% used and is most economically and ecologically justified.

## Ecology

By applying KornetCity system in Belgrade, the number of participants in motor vehicle traffic may be reduced for 8%. **The production of air pollution from motor vehicle traffic could be reduced for around 10%** (tertiary sector employees use cars much more than people employed in other sectors).

In similar size and larger multifunctional cities positive effect of KornetCity would vary according the local characteristics (the percentage of people in Target group, the average distance between home and work, development of public transportation system, etc.) but, it is most probable that the CO<sub>2</sub> reduction will be same or greater than in Belgrade. In a word: KornetCity can bring both cleaner air and a profit according the i.e. Green Paper on Greenhouse gas emission trading within the European Union.

### ***The Time or “Walk to Work”***

We have less time and it runs faster. It is waste to spend this valuable resource on boring and unnecessary traveling. **A person, who works in the office and travels to and from work for 1 hour, spends 2 hours daily for that purpose. During his/her working life this person will spend some 2 years in the public transport, taxi or car.** If KernetCity is established as an alternative to today's traditional office, this person will walk to work for 10 minutes and also 10 minutes back home. The time spent this way is 6 times shorter than the first option.

### ***Investor's point of view***

According to Serbian Law of Construction, it is necessary to provide 1 parking place per 80m<sup>2</sup> of net office space. If the KernetCity is legally recognized as an option, the budget for Kernet building will be up to 25% smaller than the budget for the same size standard office building simply because the Kernet building does not require garage space.

### ***Role of Authority***

Implementation of KernetCity would share the burden of solving traffic problems between Authorities and SME. By providing a variety of benefits for Users of Kernet (tax relief, better conditions for loans, etc) the Government would experience the relief from huge investments and long lasting projects (of roads, garages and parking construction) and also provide conditions for reduction of air pollution level.

### ***Conclusion***

Kernet is logical transformation from physical business organization to digital organization, and it's only a question whether we are willing to use this opportunity in order to reduce the CO<sub>2</sub> emission. Education of the nation, cleaner environment and time saving are categories whose development at first glance does not bring profit but in a few years we may be surprised, pleasantly.

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Milica Grozdanic  
Cultural Heritage Preservation Institute of Belgrade  
Serbia

Maja Dimitrijevic  
Cityplan  
Serbia