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THE HOLLOW CITY : A RING AS AN URBAN UTOPIA OR AS A MODEL FOR SUSTAINABLE URBANIZATION ?¹

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Abstract

Nor compact, nor sprawled, the hollow city is built exclusively in the immediate vicinity of a tramway line designed as a ring. It therefore looks like a succession of dense and functionally mixed districts —sort of delocalised linear city centre— surrounding a vast green area. This city grows not in a « surfacic way » —by sprawling—, but in a « linear way »— by weaving additional meshes.

In this paper, the principles of the hollow city are first presented. The relevance of this urban model as an alternative for future urban designing and landscape planning is then discussed, especially in terms of its sustainability : a quantitative assessment thus shows that such a city would be highly efficient, in terms of energy saving as well as ground saving. The question of feasibility of a hollow city implementation is at last brought up through some case studies.

Keywords : sustainable, urban design, land planning, urban utopia, space organization, ring, mass transportation

¹ A key basis of this paper is Jean-Louis Maupu's book *La ville creuse pour un urbanisme durable* (The hollow city for a sustainable urban planning)

Introduction : background of the Hollow City.

It is certainly nothing new to state nowadays that more than ever, growing process has simply reached the limits of our planet. Therefore, a radical change of the way the cities are planned and built (and/or rebuilt) appears to be a must, simply because actual mode of city growing is not sustainable for different reasons, among which let us point three quickly coming grave shortages :

- energy shortage : how long will last the world's oil reserves ?
- breathing air shortage : how long will it be possible to pollute air (as well as water) ?
- space shortage : how long will it be possible for cities to grow in a way where 50 or more percent of surface (70% in Houston, cf. Figure 1) is dedicated to transport infrastructure (roads, car parks, ...) ? Let's note that this coming lack of space is directly linked to food shortage : a tarred surface is not arable soil.



Figure 1 – Views from Houston

Of course, if we consider actual car-oriented city growing as satisfactory (acceptable) —or inescapable— and if we are optimistic, we will imagine technological answers to such questions :

to the first one, let us answer that wind energy, solar energy and, why not, nuclear fusion energy, will replace (soon... let's be optimistic) fossil energy source.

Concerning the second point, we shall argue with electric car.

For the third question —lack of space— let us imagine that technological progress will allow us to build cities on/under oceans or on other planets (cf. Figures 2 to 6).

But even if we are so optimistic (assuming that such scenarios for urban future are optimistic), even if we suppose that science will offer us very soon great quantities of not polluting energy and various possibilities of gaining available space, is such a hypothetical availability a good reason to waste this energy and this space ?

The optimistic approach, on which are based answers (to the three shortages) such as these illustrated on Figures 2 to 6, is an approach which background is an ideal of infinite growth (our civilisation worship Growth), made possible by application of more and more cutting-edge technological means.

Inversely, the background of the model named “Hollow City” is based on an opposite ideal : the ideal of economical, cost-effective growth, optimizing resources. It proposes one answer (certainly among many) to the following question : in an urbanisation process, how to save maximum of energy, air and space, with minimum of technological means ?



Figure 2 – Floating city

<http://www.luxuo.fr/architecture/une-ville-flottante-ecologique.html>



Figure 3 – Floating island of greenery

<http://www.maisonapart.com/edito/autour-de-l-habitat/urbanisme-ville/sea-tree---un-ilot-de-verdure-6477.php>



Figure 4 – Floating pyramid-like city

http://en.wikipedia.org/wiki/Shimizu_Mega-City_Pyramid

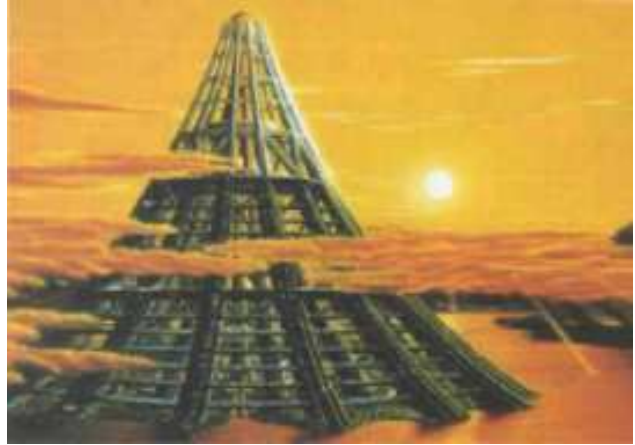


Figure 5 – Giant mountain-like city

X-Seed-4000 project for an artificial 4000 meter high mountain-shaped city built on sea

<http://swissmanrider.skyrock.com/299082689-X-Seed-4000.html>

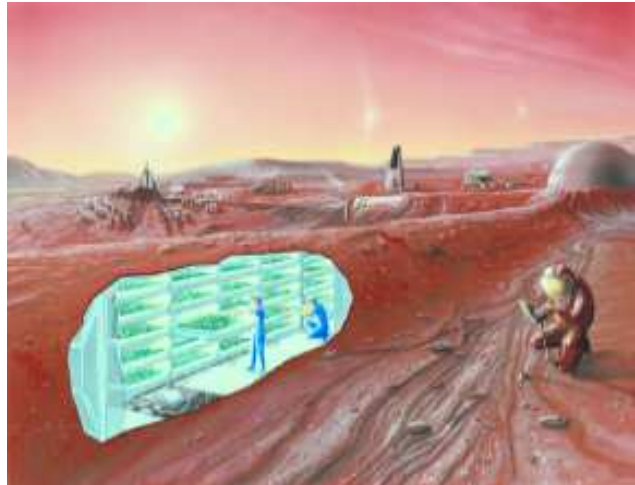


Figure 6 – Human colony on Mars

An artist's conception of the colonization of Mars, with a cutaway showing part of the interior

http://en.wikipedia.org/wiki/Colonization_of_Mars

In this paper, we point out that a city which is at the same time highly cost-effective, not polluting and pleasant to live in is possible without futurist technologies, simply by using one single tool — space organization.

For this purpose, we first propose some general principles of the Hollow City (section 1), which are all of spatial nature, exclusively (this means that no innovative technology is required). Then, we show the benefits in terms of energy and space savings of this urban model comparatively our actual car-city model (section 2), the aim being to highlight the unseen huge opportunities of the space organization lever. Finally, we tackle the issue of the transition from fiction to reality, providing parts of the answer to the question of feasibility of the Hollow City (section 3)

1.- Principles of the Hollow City.

As highlighted in various research studies based on ideas similar to the TOD [Calthorpe, 1993; Cervero, 1996; Cervero & Kochelman, 1997; Renne & Wells, 2004; Consortium Bahn.Ville, 2005; Collectif Bahn.Ville 2, 2009; Stransky, 2011; Vivre en ville, 2013; Maulat & Krauss, 2014], implementing a mass transportation mode is one among various tools of a sustainable town planning. But the choices made by decision-makers (for different reasons) several decades ago to privilege car have transformed urban shapes. As a result, a great proportion (in surface) of our cities are configured for the car.

Thus, there is no chance for mass transportation to be efficient within a context designed by another transport mode : to increase the occupancy rate of vehicles within a sparse environment, the path of mass transportation lines has to be sinuous (Figure 7), discouraging potential users from using this mode due to longer travel time.

In short, within most cities (or at least in their peripheral areas, very often suited for private car), mass transportation simply cannot be efficient.



Figure 7

The key idea on which is based the Hollow City model is to shift the urban planning current paradigm : rather than adapt the shape of mass transportation routes to urban shape, let's adjust urban shape to an efficient shape of mass transportation routes. As mentioned previously, the only basis of the proposed model is the space organization tool. More specifically, according to the logic of the Hollow City model, space organization means both :

- Give the mass transportation routes the most efficient shape : a Ring (Figure 8) of suitable size (the question of the efficiency of this shape is discussed in Box 1);
- place settlements and activities in a way to make every origins and destinations easily accessible to each others via mass transportation mode.

In other words, urban space organization involves here adapting urban shape to mass transport technical characteristics and requirements.

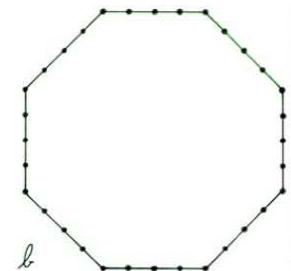


Figure 8

From this key idea, three principles may be deduced. Each of these three principles of the Hollow City is related to one scale of urban planning and one kind of space.

First principle (figure 9) : **Design appropriate rings for mass transportation routes** (appropriate in terms of **shape** as well as **size**).

This principle is related to the scale of the whole city and refers to a one-dimensionnal space : the sole longitudinal dimension, which is this one of speed (motorized movement). In addition, this line of motorized movement has necessarily to be connected to higher scale transport infrastructure(s) — regional and/or national and/or /international scales— which links the Hollow City to the “rest of the world”, especially (but not only) the central city (in case the Hollow City is located within the suburban area of an existing town). In figure 9, which shows the mass transport system of several Hollow Cities adjacent to each others, note such a connection to high speed infrastructure, for both passenger and good transportation. The central soft modes only open area — a “low speed” space— contains a dense grid of dedicated pedestrian and cycling paths.

Second principle (figure 10) : **Planning of densely built areas adjacent to mass transport stations** (settlement and activities in the immediate vicinity —to a maximum of 250 m— from stations). These high density areas may possibly be complemented by peripheral “fringes” (cf. Figure 10), low densely built.

This principle is related to the scale of a district and refers to a two-dimensional space : the additional transverse dimension is the dimension of slow movement. Thus, except public service vehicles, motorised traffic is forbidden along the traverse dimension, even within the “fringes”. and central open space. This prohibition contributes to more fluid traffic along the longitudinal dimension because of the lack of motorized crossings.

Figure 9



Figure 10

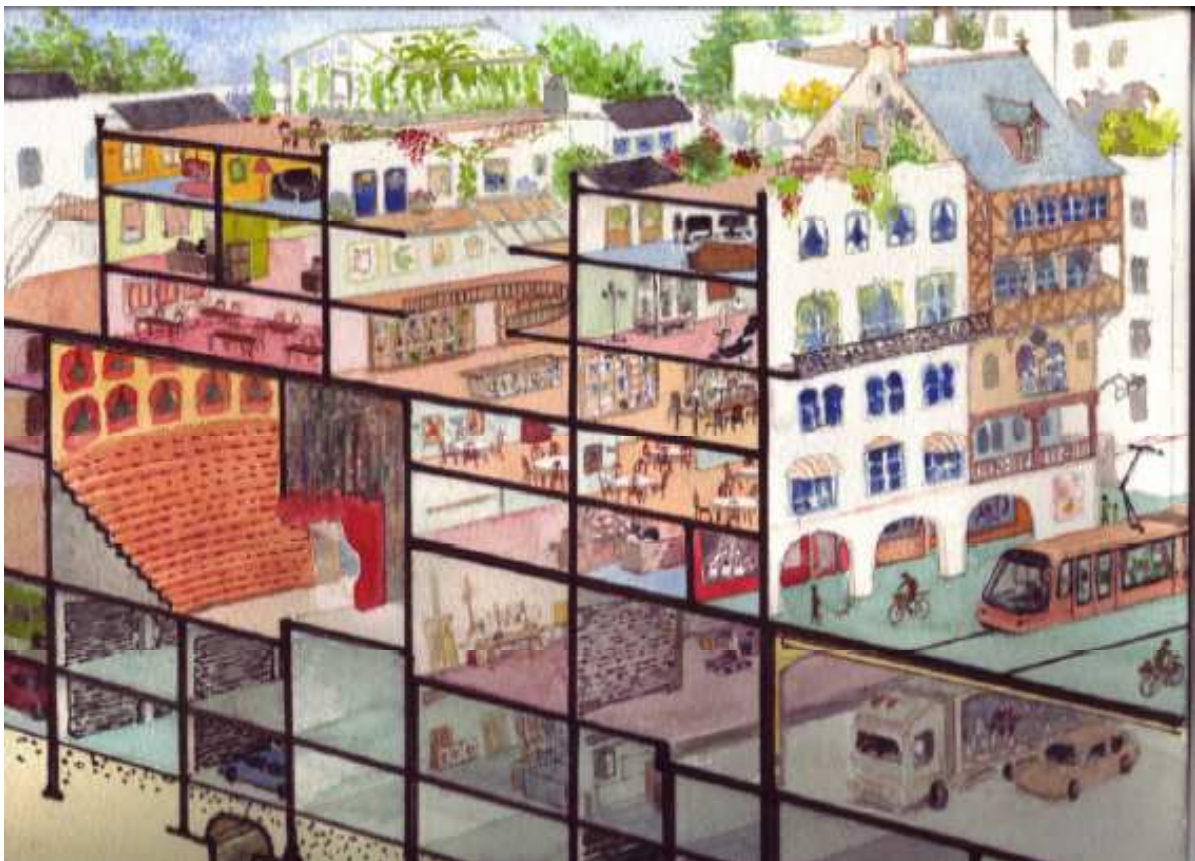


Figure 11

Third principle (figure 11) : **Functional mixity and proximity.**

This principle is related to the local scale and refers to a three-dimensional space : the additional (vertical) dimension is the dimension of architecture, this one which creates and organises volumes according to necessary and/or desired proximities (light, air, transport, greenery).

Box 1 – Discuss on the efficiency of the ring as urban shape

Efficiency of mass transportation being directly linked to the walking distance between origins and destinations, on one hand, the stations, on the other, the sole urban shape where every origin and destination may properly be served by mass transport mode is necessarily linear. This idea is not new : already in the 19th century, Arturo Soria y Mata came up with the *ciudad lineal* (linear city), stretched all along a rail line.

But compared to a line with two opposite ends, the ring (or loop) has several major advantages.

- It abolishes the “terminus effect” : assuming that origins and destinations are equally distributed along the mass transport line, in statistical terms, traffic would be equally distributed all along the route if this line is ring-shaped, while if it is not the case, the central part of the line would support greater traffic volumes than its ends. The ring shape should therefore eliminate local traffic congestion and makes the occupancy rate much more homogeneous.

- Vehicles are running along a loop in both directions, so that any point is reachable from any another point in two different ways. Thus, a transport user willing to join a diametrically-opposed point of the ring can board the first vehicle to arrive, whatever the direction of travel : for him, it is as the frequency of vehicles was doubled.

- Another advantages of the loop (compared with the line) is that below a certain size of the ring, soft modes appear as a competitive alternative to motorized modes for certain origins-destinations. For instance, in the case of a 15 km tram line forming a loop of 5 km in diameter, diametrically-opposed points are 20 minutes away by tram (with an operating speed of 24 km/h), and 20 minutes away as well by bicycle (15 km/h) when crossing in a straight line the central space of the loop.

This last advantage means that shape (ring) *and* size are both very important for the full effectiveness of the mass transport line, the choice of an adequate size being dependent upon the mass transport mode *and* soft modes operating speeds.

Let's notice that the drawings, realized by the author of *The Hollow City* [Maupu, 2006], are provided for the purpose of illustration only of the three principles, which may have been illustrated differently. For instance, on the drawing which embodies the third principle (Figure 11), we can see that the mass transportation mode is the tram and that the architectural choice made is this one of street urban planning (“urbanisme sur dalle”), very common in France in the 1960s. On this illustration, vehicles (private cars as well as trucks) run under the concrete slab (the Hollow City model does not ban this mode, but simply makes the mass transport mode highly competitive with it), where are located as well the parking areas, warehouses, certain production facilities, technical installations, etc. This architectural choice is not the only one possible. The principles may be developed in different ways.

But whatever the choice, a hypothetical implementation of a Hollow City would require the strict application of the 3 principles, which are highly constraining. In other words, on a large scale, townplanning of a Hollow City is likely to be very difficult. In contrast, a city based on

car transport system (“car city”) can grow almost without constraints : townplanning of such a car city (city of “laissez faire” ?) is very easy.

In terms of town planning complexity, superiority is therefore clearly on the side of the second one.

So what are the benefits the Hollow City can offer in compensation to its severely (excessively ?) constraining townplanning ?

2.- The Hollow City in figures or the price of an easy urban planning

It just has been said that at a global scale, a car city doesn’t require a complex planification to grow. But that simplicity (or lack of complexity) has a price. The aim of this section is to provide some quantitative rough estimates in order to compare an existing urban areas (such as Paris region or Houston) with a hypothetical Hollow City in terms of space costs and energy costs. As a complement to this quantitative comparison, some other potential qualitative advantages of the Hollow City (or Ring) model are then pointed out.

The calculation assumptions for the quantitative comparison [Maupu, 2006] can be summarised as follows.

The structuring basis of the choosen example of a hypothetical Hollow City is a loop (ring) of 5 km in diameter (as a length of 15 km is often considered as a maximum for a tram line) with a station every 500 m. With an operating speed of 24 km/h, diametrically-opposed points are then 20 minutes away by tram —a time considered as acceptable— and 20 minutes away as well by bicycle (15 km/h) when crossing in the central soft modes only open space, as routes should be very close to the distance as the crow flies (straight line) because of a dense network of walking and cycling trails.

Let’s then imagine a theoretical city, built according to the Ring model, of 60 000 inhabitants and 30 000 jobs (every accomodation, every job and every service within the dense area being at less than 250 m as the crow flies from a station) with a dedicated surface of 60 m²/inhabitant and 80 m²/job.

In terms of mobility, let’s assume 60 000 tram trips/day (in addition to cycling and walking) and 6 tram sets per direction (12 in peak hours) at 24 km/h : this means one tram every 6 minutes (or one tram every 3 minutes in peak hours).

Let’s see the concrete results.

2.1.- Results in terms of transport investment and energy saving

The author of *The Hollow City* calculates that his model’s tramway system (infrastructure and vehicles) would require :

- 100 M€ in investments. With an expected technical lifetime of 30 years, this tram investment amounts to a car investment of about 60 cars per 1000 inhabitants. This figure is to be compared to 400 cars/1000 inhabitants in Parisian conurbation and 800 cars/1000 inhabitants in USA.

- 0,2 € per trip in operating cost, i.e. 73€ per inhabitant and per year, whereas in Houston, this operating cost is about 4300 € / inhabitant.year.

- 0,25 GJ (billion Joules) per inhabitant (+ 0,1 GJ per inhabitant for an extra taxi service) in terms of annual energy consumption for transport, whereas this energy consumption is 15 GJ/inh in Paris conurbation and 86 GJ/inh in Houston.

These figures have to be considered as rough estimations. Nevertheless, they show that approximatively, the Hollow City transport sytem would require (per inhabitant) :

- in terms of investments, at least **6 times less** than in actual Paris conurbation ;
- in terms of operating costs, about **60 times less** than in Houston ;
- in terms of energy consupcion, about **60 times less** than in Paris connurbation (350 times less than in Houston).

Conclusion : in compensation to its constraining townplanning, the Ring model saves (a lot of) energy and money.

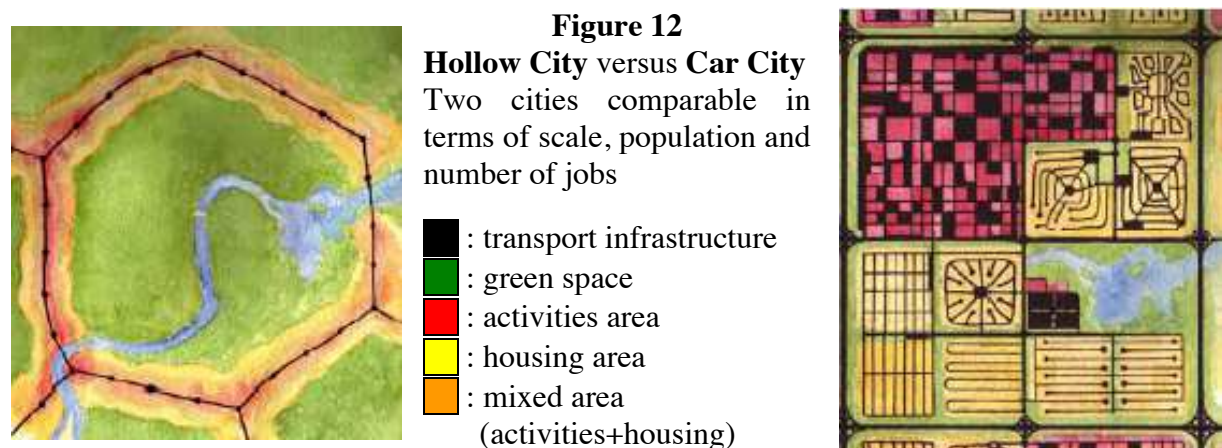
2.2.- Results in terms of space saving

As shown in table 1, which compares the theoretical case of a hollow city with the case of an existing urban area (Paris region), the adopted assumptions lead to densities which seem very realistic and acceptable, not to say clearly attractive.

Table 1

| <i>Hollow City densities</i> | <i>Paris région densities [Fouchier, 1997]</i> |
|--|---|
| 100 inh/ha in the dense area | 750 inh/ha Paris, dense district 250 inh/ha Paris, average |
| 25 inh/ha in the fringes 20 inh/ha average, overall (including central green area) | 20 inh/ha Parisian suburbs (Grande couronne) |

The figure 12 allows to make a visual comparison between two imaginary cities, built according to the Ring model for the first one (left side), according to the actual Car City model for the second one (right side). Both schemes have been drawn at the same scale (about 5 km in diameter), both cities have 60 000 inhabitants and 30 000 jobs.



Whereas in actual (car) cities, surface rate dedicated to motorized transport is most often **over 50%** (70% in Houston), it would be **less than 0,5%** in a Hollow City.

Therefore, in addition to its attractive densities (100 inhabitants per hectare, to be compared to the 250 inhabitants per hectare in Paris *intra muros*), the Hollow City would use a very low surface dedicated to transport infrastructure and offer much more (at least **five times more**) space for green areas.

Conclusion : in compensation to its constraining townplanning, the Ring model saves (a lot of) space for greenery.

2.3.- Some other characteristics/advantages of the Hollow City

Regardless to these results which point to the high economical efficiency of the Ring model (in terms of investments in motorized mobility, operating costs, as well as energy and space consumption), the Hollow City have a number of attractive features.

- It offers to every of its inhabitants an easy access to every area of a “real city” ;

- A vast green is accessible on foot in several minutes to everybody (this corresponds with the idea “nature just under the ramparts” of the medieval city). Thus, one no longer needs to use the car for country weekends.

- Every technical networks are as simple as possible (a ring) : water, electricity and gas systems, distribution of goods, postal service, garbage and waste water collection,... are all just going along the ring path.

- It offers generous and attractive densities

- It makes it possible to develop local agriculture, energy forestry, wind energy production (in the central part of the green area),...



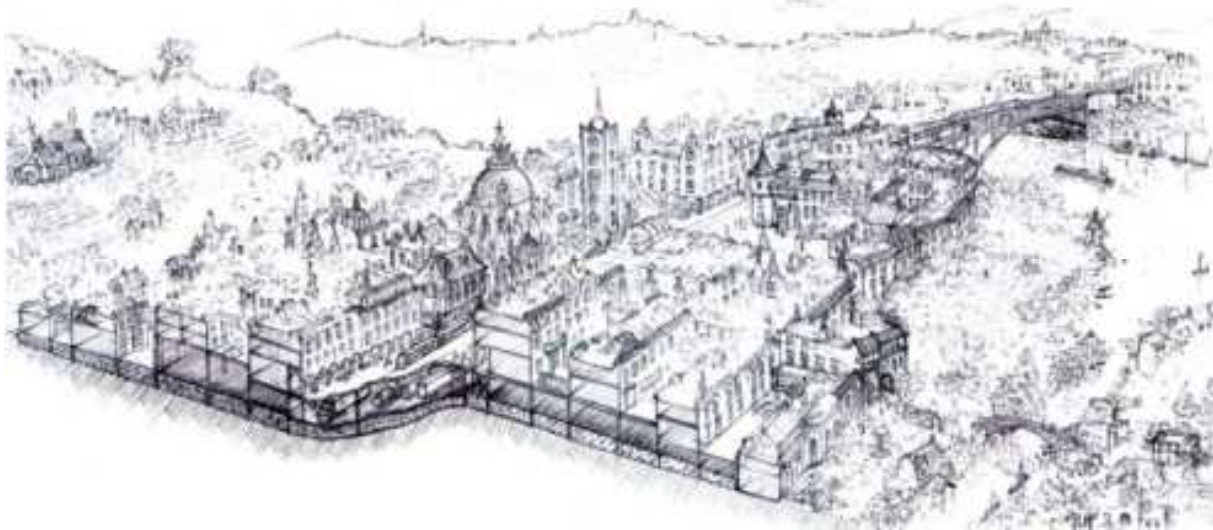
Figure 13

- It offers high quality public spaces, quiet and comfortable areas, facilitating the encounter, the dialogue.

- It should contribute to clean up the land market as well as the job market.

- It supports maintenance of the landscapes and ecosystems, as a narrow urbanized strip is much more respectful on these matters than an uncontrolled suburban sprawl : existing villages should remain as they are, simply becoming a part of the fringes. Moreover, the Hollow City model is compatible with the implementation of ecological corridors : rather than a continuous urbanized ribbon, the Hollow City could be shaped as a necklace of districts (each of them being designed around a station) separated from each others.

Figure 14



- The growing process of a Hollow City is respectful of the pre-existing territories, as this process is not sprawling, but “knitting new stitches” : according to the 3 principles, once a “population limit” is reached on a Ring (this limit depends on the mass transport mode, the acceptable maximum density, etc), a second ring attached to the first one is added, then a third ring, and so on.

The maximum limit of this growing process should be a “Flower” of 7 attached rings (Figure 15), as for a larger configuration, number of transfers may discourage people from using mass transport mode, basis of the Hollow City. In case where the mass transport mode is the tramway, the transport system of a Flower would therefore consist in 7 tram lines with an extra 8th “express line” (red line in Figure 15) along the perimeter of the Flower in order to reinforce the connection between the 6 “peripheral” rings. In the case where the city has to grow beyond a flower (i.e. more than 300 000 to 400 000 inhabitants), a new ring is planned further, on the path of the high speed line (black line in Figure 15) serving the Flower.

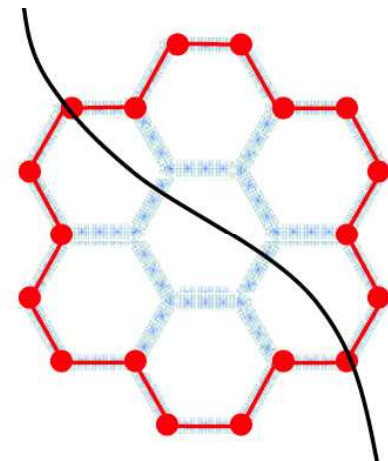


Figure 15

As said previously, the size of a Ring depends on the mass transport mode. Various versions of cities based on the Ring model should therefore be imagined. For instance, with a high capacity subway (instead of the tramway), every dimensions should be doubled (the zone of attraction of a subway station being larger) and the population density should be increased up to 500 inhabitants per hectare (let us remind that Paris higher density districts is about 750 inhabitants per hectare). Therefore, such a ring should accommodate more than 1 million

inhabitants (and a flower — a Hollow Megapolis ?— 6 or 7 millions), every job and every service within the dense area being at less than 500 m as the crow flies from a station, and everybody living just several minutes on foot from a vast green area nearly twice the size of Forêt de Sénart (the green area corresponding to a Flower being larger than the forêt de Fontainebleau — 300 km²).

Anyway, whatever the version, the figures and additional considerations raised in this second section show that contrary to popular belief, an adequate space organization all along an adequately designed mass transport mode can bring huge savings, and that for this purpose, it is not necessary to build high-rise buildings constructed close to each others. In truth, there seems to be one single law : **stay bound up with the Ring**.

Again, every figures presented above are rough estimates. They nevertheless show that comparatively to an urban area designed for (or “by” ?) the private car mode, the transport energy consumption per habitant would be in a ratio of less than 1 to 50 and the percentage of green surface in a ratio of about 5 to 1, both in favour of the city based on the Ring model. In addition, it is likely that such a Hollow City would provide a high level of life quality to its inhabitants.

With such obvious advantages of the Ring model, it seems like a natural question to ask if such a city is feasible in practice : what are main significant barriers to its implementation ? Which tools should be used to help this implementation ?

3.- Feasibility of the Ring model - barriers and tools

The purpose of this third section is to present some elements of reflexion on the feasibility of the Hollow City. We first identify and discuss some (among the various) barriers to a hypothetical concrete application of the Ring model. Then, we give some results of very simple tools tested (less or more formally) since several years as a very beginning of the attempt to bring the Hollow City into being.

3.1.- Barriers

3.1.1.- Technical barriers : too much innovative techniques ?

From the technical point of view, every techniques which would be implemented in a Hollow City are traditional. Of course, there is nothing stopping the possibility to implement in addition innovative building techniques : positive energy buildings, positive energy housing blocks or even city blocks, etc ; all this is perfectly compatible with the Ring model.

3.1.2.- Economical barriers : too expensive ?

Concerning the costs, the author of the Hollow City [Maupu, 2006] gives a rough estimate : the realization of a 60 000 inhabitants ring would cost about 10 billions euros. Therefore, as in France, the amount of new built areas every year is equivalent to 10 or 12 Rings of 60 000 inhabitants each, the cost of the new built areas every year in France, if they were built in a Hollow Cities form, would be about 6% or 7% of the French Gross Domestic Product (to be compared to the 16% yearly dedicated to transport). Is it really too expensive ?...

3.1.3.- Progressivity barriers : too long ?

Clearly, as outlined above in the second section, the benefits of a Hollow City are obvious once the city is completed, with its 60 000 inhabitants which guarantee a high occupancy rate

to the 12 tramway sets (24 in peak hours). But what about the phase-in period, which may take decades ? To be realistic, the model needs an implementing scenario which makes it possible to stop the project at every moment and obtain nonetheless, whatever the stage of its achievement, a reasonably suitable result (even if its energetic characteristics are not as tremendous as those of an achieved Hollow City).

In his book, Jean-Louis Maupu [Maupu, 2006] outlines such a scenario. For instance, at the very beginning of a Hollow City, we can imagine a bunch of villages or small centralities, forming vaguely a ring and having to a certain extent some relationships of complementarity with each other (so that there is a reasonable travel demand between these centralities). A ring shaped high level service bus line connecting these should be the starting point to a future Hollow City.

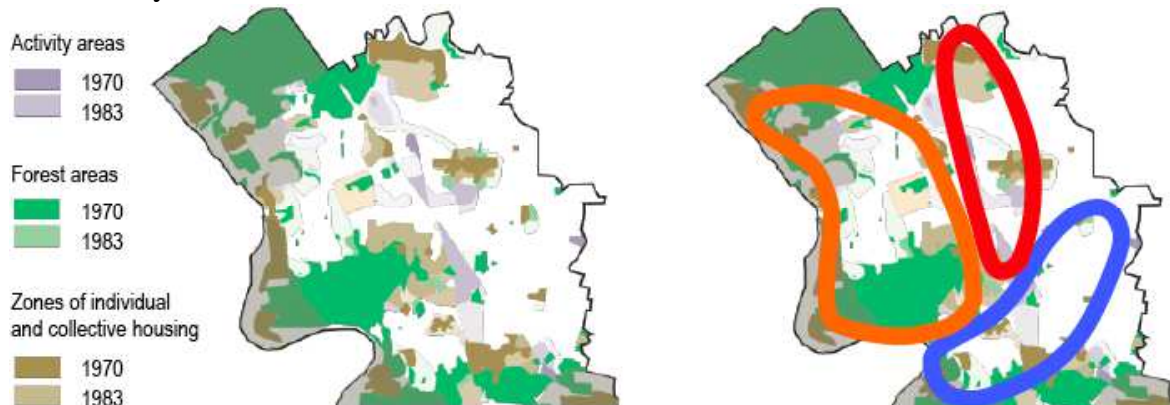


Figure 16

As an example of “what things should have been” if different political choices have been made, the territory of the Ville Nouvelle de Sénart (10 communities) has much to teach us. As it appears in **Figure 16** (left side), in 1970, this territory was dotted with relatively small urban centralities and small activities areas, which should have been connected with each others by just three contiguous bus lines loops as a possible embryo for a three-rings hollow city (**Figure 16**, right side). If we consider that between 1970 and 2008, the population in fact increased from 17 000 to 110 000 (i.e. an average increasing rate of 5% every year) we can imagine what the result should have been in an hypothesis of densification all along the path of these lines (which should have become tram lines) instead of the classical low density built area spreading (which has actually happened and goes on very quickly).

Thus, if the Ring model has been promoted in 1970 (3 bus loops connecting urban centres and principle activity areas of the 10 communities, each bus line being moreover connected to the régional express railway transport which links this territory to Paris in 35 minutes), we should have had today 3 Rings of 40 000 inhabitants each instead of the actual sprawled car-shaped configuration, where tortuous bus lines try desperately to offer a credible alternative to the private car mode (**Figure 17**).



Figure 17 [Soudier, 2011]

3.1.4.- Lack of dynamism barrier : too late ?

In the field of city building, it is often said that the adequate time scale is the century (although we know some cases where the surface of a city doubled in only 20 years, because of the sprawl made possible by the private car mode).

But even if, in a country as France, the renewal of built areas is very slow, about 1% every year (let us recall that in France, the amount of new built areas every year is equivalent to 10 or 12 Hollow City rings of 60 000 inhabitants each), let us state the following very simple hypothesis relative to main origins/destinations within an existing urban region (left part of **Figure 18**) : 30% are already accessible in sustainable urban Mass Transport (MT) mode (existing dense city, red rectangles); 20% of built areas (agricultural buildings, some industrial buildings) remain where they are, outside the city (green triangles); 25% are already located on the route of a hypothetical loop (orange circles); 25% are already located on the route of a hypothetical loop (orange circles).

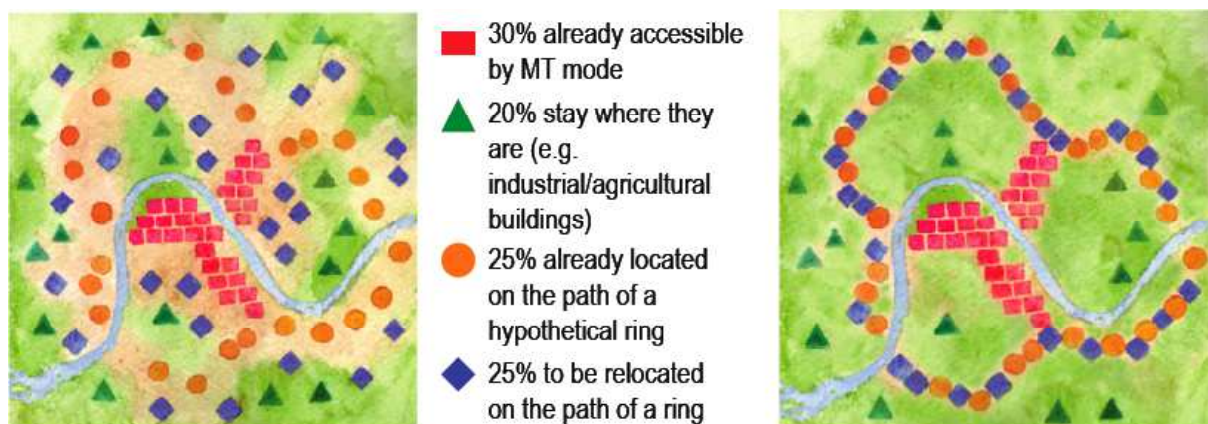


Figure 18

In this hypothesis, the actual 1% renewal rate that we have in France makes it possible to place the remaining 25% (blue diamonds) on the loops in 25 years (right part of **Figure 18**). 25 years should thus be sufficient to change our daily mobility. And 25 years, it is less than time which was necessary to adapt our cities to the car, during the “Trente glorieuses” period. Therefore, is it really too late ?...

Let us add that there are several cases in France where the renewal rate is actually much more than 1% (as mentioned above, in Ville Nouvelle Sénart, where the average annual increasing rate between 1970 and 2008 was 5%, one should have imagine a way of urbanisation alternative to this one based on car accessibility, actually brought into play). But even if we suppose that such a case is exceptional, so that the 1% renewal rate is too optimistic in our countries with their lack of demographic dynamism, why not consider the rest of the world ? It is not said that the Hollow City model is valid only in Europe.

3.1.5.- Political barrier : people will never accept ?

This point brings us to the question of the accordance between collective greater and individual greater. One among the criticisms maid to the author of the Hollow City is that in a democratic system, people cannot be forced to live in a paeticular way. If most people’s ideal is a detached house far from the city centre, it is their right (*vox populi, vox dei*), and as long as the Hollow City does not fit to most people’s way of life, it is not acceptable in a system based on individual freedom.

In this respect, two objections could nevertheless be made. First, where is freedom of those people who had to flee far away from cities because of car nuisance ? Why should the freedom of car users be stronger than the freedom of those who just wanted to stay where they lived without having car nuisance ?... Second, isn’t people’s present way of living the consequence of the campaign —that has been going on for decades— to promote the private car as a wonderful instrument for freedom, by making it possible to live in the middle of the countryside and to take just several minutes every day to drive to work, to school, to do shopping ? Would people really have chosen such a lifestyle if they have been told instead

that one day, they'll have to make the choice, in winter, to heat their house or to take their car ? Isn't the actual urban form of our cities —made by and for the private car— the result of the expression of a sum of individual apparently “free” choices, but made in a context of very poor alternative supply, where people are too often free to choose between the car... and the car ? No alternative equals to no freedom. In this respect, the Ring model is an attempt (certainly one among many possible) to make richer the alternative supply.

But to what an extent is it likely that a Hollow City —this alternative supply— could be considered as desirable ?

It seems to us that an adequate observation of actual urban shapes can help to find a possible answer. In his book “La fractalité des structures urbaines” [Franskhauser, 1994], Pierre Frankhauser focuses on the fractal character of urban shapes and proposes as an interpretation what he calls the “blocking dynamic”, which preserves areas from being built and therefore highly increases the length of the border between built and not built areas. The **Figure 19** shows the fractal character of Berlin urban shape from 1875 to 1945, and the preservation of this fractal character over time. This lasting fractal character should be the result of a collective will to live in the vicinity of *both* a dense urban centre *and* open field : the longer the border between “city” and “countryside” is, the greater is the number of households benefiting from this double vicinity. If we consider that urban shapes are the result of a self-organization process, which is in fact an expression of the sum of individual freely made choices, the fractal-like shapes of cities and the preservation of the “fractality” all along the urban sprawling process should be an argument for the social acceptability of the Ring model (Hollow City) which enables to meet these two complementary needs — “pooling” against “isolation”, “proximity to others” against “quietness”, “tumult” against “silence”— or, in other words, reconciles the simultaneous need to live both “in the city” and “outside the city”, and appears therefore as a solution to channel and streamline this self-organization process.

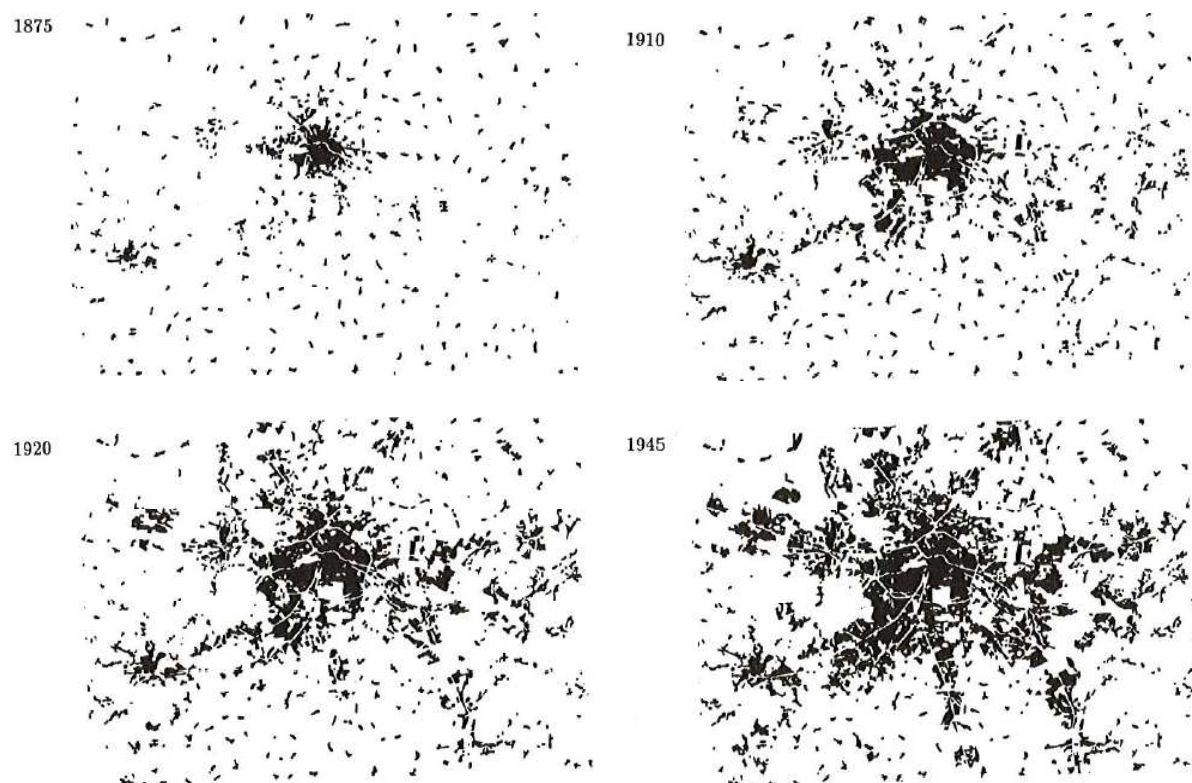


Figure 19 : the lasting fractal character of Berlin region [Franskhauser, 1994]

And in a democratic society, as soon as a project is merely in line with the aspirations of the majority (this will to live simultaneously “in the city” and “outside the city”), it is politically acceptable. Let’s notice that this argument would certainly need to be deepened.

Other signs suggesting the possible acceptability of the Ring model should be taken in various current topics widely spread by articles and speeches, for instance the question of shortening the supply chain with the “Urban Farm” [Viljoen *et al.*, 2005] —closely linked with the innovative contemporary concept of Zero Km Farming [CESR, 2009]—, or the debates about how to make the suburban areas more attractive (e.g. the french “Espoir banlieues” plan).

Besides, let us mention one issue that surface increasingly often in the debate about urban projects : the question of scale. In this regard, when referring to the question of “urban micro-projects that exalt the talent of the artist”, Jordi Borja, a former deputy mayor of Barcelona, cannot be more explicit. He said : “There is often a lack of large-scale projects, that is to say projects on the scale of the whole city” [Dubois, 2011, p.74]. Clearly, there seems to be a real demand of large-scale projects from the decision-makers themselves... as an indirect expression of the elector’s will ?

3.1.6.- Conclusion : and now ?

Various other barriers should certainly have been identified and discussed within this section, but even such a brief and incomplete overview put the importance of some of them into perspective : besides the question of technical feasibility, economics, time and lack of demographic dynamism do not appear as insurmountable problems. Moreover, three arguments for a possible acceptability of the Ring model have been identified : Hollow City as a compromise likely to satisfy the majority, Hollow City as a possible answer to some questions currently being debated, Hollow City as an answer to a demand from decision-makers.

All this gives several indices for the arguability of the implementation of the Ring model “in real life”. As researchers —and not decision-makers—, which tools should we therefore imagine to help such a hypothetical implementation ?

3.2.- Tools

We are today at the beginning of a process which final aim is either to bring the Hollow City into being, or to prove definitely that its implementation is not possible, whatever the reason. Let us imagine for a moment that our highly challenging target is to put the Ring model into effect (it’s not a crime to dream). We could then try to find out to what an extent it is just a dream. For this purpose, we provide food for thought on feasibility, real or perceived : how would the Hollow City be accepted if we propose it to different persons and categories of persons ? To answer to this question, we have been proceeding for several years to deal the model with the reality of the ground, using two different approaches, or tools : the “informational tool” and the “reality check tool”.

3.2.1.-Informational tool

This approach is to simply present the model and notice the immediate and later reactions. It is being put into practice since the publication of Jean-Louis Maupu’s book, in different ways and less or more formally, by both authors of this paper. Examples of this approach were conferences and seminars made for various publics by the author of *The Hollow City*, the

publication of a book review [Stransky, 2007] and the communication for the International Scientific Conference BUFTOD [Stransky & Maupu, 2012].

The results of this approach may be interesting, as shown in following example.

In 2006, when *The Hollow City* was about to be published, Jean-Louis Maupu gave an abstract of his book to a Korean visiting researcher who was in charge to reflect about the transport system of a new Korean sustainable city which was about to be designed for an international competition.

Several weeks later, the different proposals were available on the website of this competition (www.mppat.or.kr). **Figure 20** shows Sejong, the Korean New sustainable city project (entitled “A ring structure of the Multi-functional Administrative City”) proposed by the project team of which this researcher was a member.

Does this example (among several others) of spontaneous inspiration allow us to conclude that the idea of Hollow City model is possibly not so bad ?



Figure 20

3.2.2.-Reality check tool

The second tool questions various aspects of the Ring model, especially its relevance in the hypothesis of its implementation on concrete study sites.

Since 2007, several subjects related to the Hollow City have thus been proposed to students of the Master « Urbanisme et Aménagement » at the *Institut d'Urbanisme de Paris* (Urban Studies and Planning Department of University Paris-Est Créteil). So far, three master dissertations and one scientific traineeship have been achieved under Vaclav Stransky's supervision. All of them reveal interesting findings, which brief summary is provided below.

— Jean-Baptiste Mouton's dissertation [Mouton, 2008] proposed an application of the Ring model in response to a call for concrete ideas made by a local elected politician for a sustainable development of the territory called “Boucle de Chanteloup” along a curve of the Seine river in Yvelines, 20 kilometres northwest of Paris (**Figure 21**).

Unfortunately, this dissertation had no chance to lead to practical impact as it took place during local election campaign.

At least, this example shows that there exists a demand for ideas in the field of sustainable land-use planning, as well as it highlights the importance of the episodic barrier of elections and the strong barrier of local administrators' political rivalries, in the case of a supra-municipal scale project.



Figure 21 [Mouton, 2008]

— Romain Ferrez's dissertation [Ferrez, 2010] focused on the confrontation of the Ring model principles with the legal town planning documents of Ville Nouvelle de Marne-la-Vallée (east of Paris région, **Figure 22**), particularly the PLD (Local Travel Plan, which is the local version of the PDU - Urban Travel Plan).



Figure 22 [Ferrez, 2010]

As a conclusion, no significant contradiction was identified : the Ring model is in accordance with prevailing relevant legislation, as formalised in the package of laws LOTI - LAURE - SRU (french laws on air quality, solidarity and urban renewal).

This dissertation does not identify any legislative barrier, so that it provides another argument in favour of the feasibility of the Ring model.

— Jean-Christophe Raulo [Raulo, 2013] continued in the same vein by objectively identifying, within the current French legal framework, all the elements which could be mobilised to assist the implementation of the Ring model. His conclusion was that French planning legislation already has in place all the necessary tools to make this implementation possible (in the end, everything comes down to political will). In light of this, J.-C. Raulo has then developed a “seven-stage, sixty-year” scenario to bring the Hollow City into being in the context of France.

— Narindra Rakotonirina [Rakotonirina, 2013] proposed an adaptation of the Ring model to the Malagasy context. As case study, she selected a suburban area of the City of Antananarivo. The dissertation drew the conclusion that the Ring model stays fully relevant within a cultural context very different from this for which it has been designed. In particular, the central space of the loop could here be used as a storm water rétention pond (to prevent flooding) and as rice field.

This possible absence of cultural barriers for the Ring model should be another argument in favour of the feasibility of a Hollow City.

— François Adoué’s scientific internship [Adoué, 2011], completed within the LVMT, consisted in computer modelling of a Hollow City (**Figure 23**) in order to compare theoretical accessibilities (by car and by mass transport) within 2 spatial city models : ring model compared to the radioconcentric one.

As a conclusion of the mathematical simulation, the ring shape seems to be more in favour of the mass transport mode than the star model. However, these findings are preliminary, as unfortunately, the duration of the internship was insufficient to adequately guarantee their relevance.

Further developments of this work are to be expected.

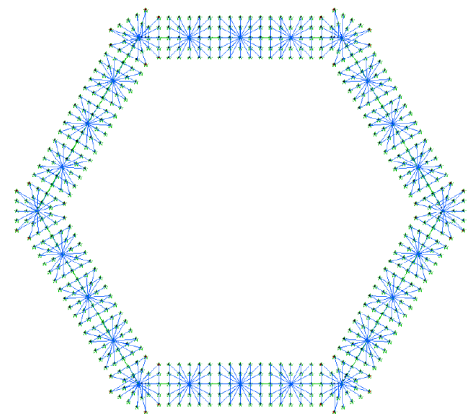


Figure 23 [Adoué, 2011]

— In her dissertation, Aurélie Krauss [Krauss, 2011] proposes to take as a basis the project of a Tram-Train line intended to link Nantes to Châteaubriant (and possibly the future airport Notre Dame des Landes), and to complete this project with a BRT (Bus Rapid Transit) line so as to design a mass transport ring connecting to each other main urban centralities and activity zones within the northwestern suburban area of Nantes (**Figure 24**).

The scale of this proposal is obviously different from that of the original model (the perimeter is three times the size of Jean-Louis Maupu’s tramway loop).

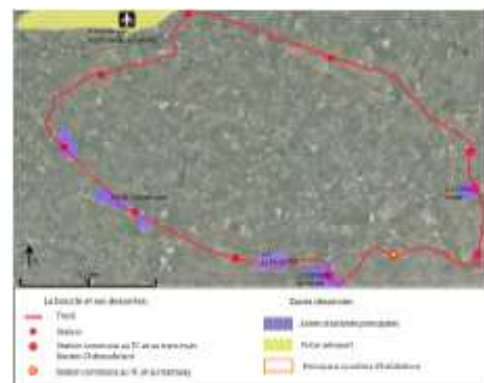


Figure 24 [Krauss, 2011]

But the sustainable mass transportation mode on which this project is based, the Tram-Train, should have a higher operating speed in a context where the distance between two stations is much greater (3 to 4 kilometers).

An interesting outcome of this dissertation is the reaction to this proposal of competent personalities in charge of transportation, town or land-use planning on different territorial scales (municipal, intermunicipal, regional levels) who were interviewed by Aurélie Krauss : all of them consider that this project would have very positive effects on this key territory and its inhabitants.

Conclusion : what is this all for ?

First of all, it should be emphasized that Hollow City is not a recipe to be applied as it stands ; it is an evolving model. As said at the beginning of previous section, the question of bringing this model into being is still open at this stage of our reflection process, which outcomes remain very incomplete, as numerous important issues have not yet been addressed : the question of possible/impossible governance of such a city ; the balance between public/private in its production ; the constraints of ownership and land speculation ; the too sharp split with history of human settlement ; the question of procurement procedure ; the appropriation of the Hollow City (i.e. the fact that the supply-based approach developed throughout this paper makes it difficult to assess the degree to which hypothetical residents would —or not— take advantage of the opportunities offered by the Ring model to function in the manner intended by its author) ; and numerous other motives —financial, sociological, geographical, political (the implementation would be costly and would go beyond the decision-maker's mandate), cultural, aesthetical,...—, that may call into question the operational nature of the Ring model, might certainly be found.

In view of this, what purpose could be served by reflecting on this urban utopia ? What's the use of thinking about unreality ? To answer this question, two approaches are suggested.

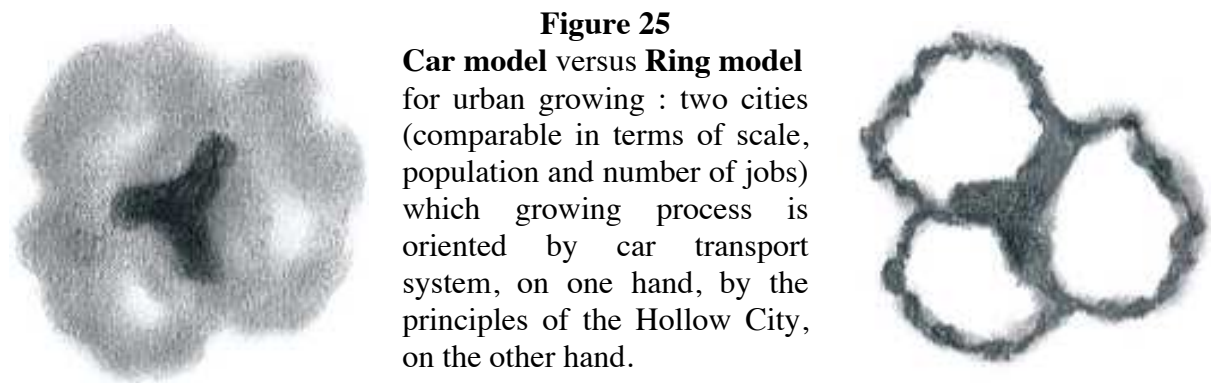
— *“Project-oriented” approach : utopia as goal for which we should continue to strive ?*

The impossibility of implementing an “ideal city” should not stop us from trying to make some tentative steps toward it, by simply reminding several vital needs and the conditions for their long-term satisfaction. Making known this utopia is a first necessary step. We hope the model will be transformed, enriched and nourished by the ideas of everyone involved. And it would be a good thing if the meaning of such a metamorphosis of the Ring model were its appropriation by the community of citizens.

As we have tried to show in this paper, the process of the enhancement of reflection on the Ring model implementation has been in progress for several years, partly by means of concrete case studies, as well as feedback from our interlocutors. Among various received comments, two should be especially mentioned, as they constantly recur in discussions.

1) Contrary to what is often said, there is actually no existing example of Hollow City. In spite of a surface similarity, the Randstad Holland does not fulfil any of the three criteria (principles) of the Hollow City, as presented in section 1 of this paper : the size of the loop is inadequate (over 300 km of circumference) and motorized movement does not take place in the sole longitudinal dimension (first principle); all settlements and activities are far from being in the immediate vicinity (on foot) of mass transport stations (second principle) ; functional mixity does not apply as a general rule within Randstad Holland (third principle). In the end, Randstad Holland is just a necklace of conventional cities, not a Hollow City.

2) The apparent over-ambition of a hypothetical implementation of the Ring model “in real life” needs to be kept in perspective. Despite appearances, the author of *The Hollow City* does not consider himself as a demiurge, nor does he aspire to knock down whole areas of cities to rebuild them according to his model. The issue here is neither *tabula rasa* nor building a city *ex nihilo*. Save in exceptional cases, that should potentially be relevant only in some emerging countries (China, United Arab Emirates,...), hypothetical implementations of the Ring model in Europe may concern only suburban areas. In our countries, the only operational goal of the model is to propose a credible alternative to the actual car-oriented urban sprawl (**Figure 25**).



That being said, the transition from fiction to reality is nevertheless highly challenging and a strong political will clearly appears as an absolute precondition to the possibility of this implementation. Therefore, assuming that “*the true politician is this one who has the courage to face up to temporarily unpopularity of necessary measures, to major financial investments to gain long-term benefits, to a possible electoral defeat to promote ideas he believes to be right*” [Burgel, 2008, p.121], the only key question relative to the debate on the feasibility of the Hollow City is : how many such *real politicians* do we have nowadays ?

— “*Reflective approach*” : *utopia as food for thought* ?

Utopia should feed the debate on town planning of the future and contribute to ideas and discussions on various topics.

The huge energy saving potential of the sole “spatial arrangement” lever (often undervalued, not to say totally neglected) is one among them.

Moreover, assuming that estimates presented in the second section (*The Hollow City in figures or the price of an easy urban planning*) of this paper — as well as the figures on which all these calculations and estimates are based — are not false, the energetic advantages of the Ring model appears so huge (let us remind that comparatively to a car city, the Hollow City transport system would require, per inhabitant, 60 times less energy than in Paris conurbation and 350 times less than in Houston), that we think it is worth going on the reflexion not only on the possibility (or impossibility) to break the feasibility barriers, but also on the meaning and the implications of “living in a city” or, more widely, “living in society”. In this regard, the Ring model appears as a pretext to reflect on questions such as individual and collective freedom, or illusion of freedom. Freedom is not lack of constraints. Freedom and constraints go hand in hand. Imposing certain constraints may generate certain types of freedom (freedom to everybody to walk through the woods every day or wander through farms year-round). Conversely, offering certain types of freedom may generate certain types of constraints (totally free use of motor vehicles deprives other people to walk in a quiet and not polluted surrounding). In the field of fast moving (fast means here “significantly faster than walking”), the loss of one degree of freedom according to the first principle of the Hollow City (the

ability to move fast in only one dimension —along the circumference of the Ring— instead of the “usual” two dimensions —in every directions of a surface, thanks to a dense and highly meshed network of tarred tracks) makes it appear another forms of freedom (as said all along the description of the Hollow City, e.g. freedom for everyone access on foot to healthy and safe environment).

It is then up to every citizen to identify his priorities in terms of basic freedoms —and therefore in terms of constraints he is prepared to accept— and to make them known to politicians.

Finally, as a concluding remark on the issue of the benefits and relevance of the Hollow City utopia, the floor is given to Marc Wiel, the well-known urban planner who wrote a very instructive Afterword of Jean-Louis Maupu’s book :

“One never knows when changing context will make suddenly possible what appears today as an utopia. In the near future, the car city may not survive. In that case, we cannot predict the urban shape which will replace it. It won’t necessarily lead to revival of past urban shapes. The debate is open but at the moment few are aware of it. Everyone knows the time it takes to stop a huge vessel traveling at the full speed, the same is true of the urban system. We therefore need to use every means possible to look for new ideas [...]. This is what the utopian model is for.”

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