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Changing urban dynamics: Empty building spaces

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Abstract

The Netherlands are facing a problem of vacant buildings or building spaces. The present study focuses on vacant office building spaces and their possible solutions. The transformation or reuse of the building has not been very successful as the available space is way too large or does not meet the requirement fully. The study focuses on the possible transformation based on area, location and feasibility. The study has analysed and suggested multiple feasible solutions to the empty spaces in Amsterdam as per the current scenario. The environmental impact by these transformations has been calculated in terms of Carbon Equivalent, making it a sustainable approach towards development of future. Then the Carbon Equivalent has been converted to carbon credits to evaluate the benefits of the transformation in financial terms. Last but not the least, the study has analysed the current scenario in developing countries like Saudi Arabia and India and suggested to take required steps at present to avoid problems in future.

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1. Introduction

The Netherlands deals with more and more vacant office space in spite of increasing population. In the first half of 2011 around 7.04 million m² (square metre, sq. m) of

building space was vacant. This brings the total vacancy in the Netherlands at a number of 14.4% of the total office space in the Netherlands. The total sold square metres are 505,000 in the first half year of 2011, way below the common level (Algemeen Nederlands Persbureau, 2011). In a 'healthy' office market around 4–5% is normal for vacancy in buildings (Zuidema and van Elp, 2010). This space acts as a buffer area to meet up to the normal space requirement without the construction of any new area, likelihood of moving from one place to another, to be available for rent or sale. Besides this we also have empty school buildings, industrial complexes and so on. This paper is a combined

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attempt of various fields (Facility Management, Architecture, Environmental and Civil) to find a solution to these vacant office building spaces in a sustainable manner.

In Amsterdam, the capital of the Netherlands, 17% of the office space is empty. This is around 1.3 million m² of vacant office space (Zuidema and van Elp, 2010). The municipality of Amsterdam sees this as a problem and wants to solve this problem. The owners of the buildings will not work out solution by themselves, because they often pay less the way it is. Often when they need to rebuild it or change it from office into residence, it will cost them more money or the rent will drop down. So if the municipality wants to change this situation they will have to be the one who has to work on it. They made a map about how many buildings are empty or only partly empty because we are not only talking about totally empty buildings, but also buildings which are 30% or 50% empty.

One of the problems is that there are requests for residence, education and healthcare, but the buildings that are on the market to rent or sale are mostly office buildings and some shops. There is not really a request for a building of 100,000 m²; there are requests for smaller spaces/areas. The groups that are searching for a location are not always looking for the cheapest, but many others, of course, are looking at the location of the building or at its quality. So it cannot be concluded that expensive buildings cannot find renters, it depends on what they have to offer for that price.

In June 2011 the municipality introduced a new law in Amsterdam: Owners whose buildings which contain more than 10.000 m² and are empty for longer than half a year, have to report their buildings to the municipality. If they do not report their buildings they have to pay a fine/penalty to a maximum of €7.500. Buildings which are empty for more than a year can be assigned with a new owner by the municipality and the owner has to approve, unless there is a good reason. It can be given to students, artists or a company who want to move into the building (Zwerfkei, 2011).

But there are more solutions than giving the building to students, artists and companies, why not consider elderly people, handicapped children and the public/community. These groups also ask for more places to work, live and spend their spare time. Since empty buildings have divergent structures the options have to be considered accordingly. This is seen as a problem, they occupy space which could have been used differently and we have to incur costs to keep the buildings in good condition. To keep a building in good condition is not easy, for an empty building this is even harder.

In the Netherlands for example 14% of the buildings are not used. And in some towns even 20%. This is too much and they expect it to increase only more. Here are a few options that were considered to be feasible and economical for the reuse of empty building space, because there are a lot of requests for other buildings.

2. Methodology

The study focuses on the problem of empty building spaces in Netherlands and suggests multiple solutions to how these can be utilised saving resources and money at the same time. The empty building can be empty as a whole or can be empty in part (30–50%) which the study has termed as empty building spaces. To make it relevant and easier empty building and empty building spaces both represent the same. This is not a case study of a single building, it is a collective study of all buildings or building spaces.

The environmental impact has been evaluated in terms of Carbon Equivalent, produced for constructing the required space of the same area.

The Carbon Equivalent has been evaluated in terms of carbon credit to evaluate the financial benefits which are totally overlooked when empty building space problems are solved.

Lastly the study tries to set up the example of Amsterdam in developing countries like Saudi Arabia and India, because what the developed country faces now will be faced by them in the very near future. Saudi Arabia and India both share the same pattern of construction boom going around all over the country and are emerging economies at global level. Further the authors are from these two countries which allow them to have a deeper and closer study of the developing pattern of the two countries.

2.1. Healthcare facility for the elderly

Office buildings can be altered to be used as a healthcare facility. In the Netherlands the demand for healthcare facilities is growing, especially for elderly people and children with disabilities. This way we have nice spaces to build the facilities the elderly people need. Because the office buildings are often large we can make multiple wings in the building: a wing with rooms to live in, a community space, a place where the doctor has his office and so on. In the summer they can go outdoors easily and meet with others on a terrace, but in the winter it is often too cold and elderly people do not go out to meet others. So if we make a community space they can still meet others. That makes it nice for the people who live in this building too, because people from outside also visit. Handicapped children often need some facilities that are the same as elderly people: consulting a doctor, need for medicine, frequent need for places to practise and maybe a few classrooms. These can all be provided in one building .

2.2. Public spaces

In the 'new trend of working' people want to meet and discuss work in public spaces. . They do not have to go all the way to the office, they can just meet midway in public spaces from their own homes. In such public spaces they can meet and have their conversations in peace. And not too much investment is required, just some relaxing

furniture, an internet connection and some coffee. This is quite easy to provide, because an office building has already spaces for this, so you do not have to reconstruct the whole building. You can just reserve some rooms for this.

2.3. Student accommodation

The request for houses also keeps rising, especially rooms for students. More and more students are looking for a room and the lists keep growing. In Amsterdam for example they placed containers for the students to live in, but you cannot really call this a room. To prevent this problem we can work out the idea of making rooms for students in these empty buildings.

2.4. Library

Because of the above discussed problem more and more students keep living at their parents' place. Home it is not always the right place to study in peace and these students start to ask for a public place where they can study in peace. Otherwise they would have to go to the university to find a nice peaceful place to study. This also is quite easy to provide in an office building. Because they sort of need an office too, not just a peaceful place and office buildings are often quite isolated and shielded against noises from outside.

2.5. Gym

As Dutch people wish to live a more healthy life sport is something that needs to be practiced at least 30 min every day. A lot of people do not have time to play a team sport and just wish to go to the gym for one hour daily. Then you have to travel to the gym, change, exercise, change and travel all the way back. It would be way more practical if you can combine it on the way to work, as in a public space. If these are both at the same location, the public space and the gym, you can have the meeting first and then exercise for one hour. There is no need to travel more and you can easily relax for a long time and it is nice to stretch your legs.

2.6. Cultural place

We want everyone to acquaint with culture, though often this is very difficult. To the youth it often sounds boring, going to a museum or an exhibition. And when we are tied up in work, where can we find the time to go and see something cultural? An exhibition does not need to consist of hundreds of art pieces, you can just show a smaller collection. It would be easy to display a small collection in such a building. For example for a student it would not be such a big step anymore. If you have been in the public space to study and you see the nice advertisement of this exhibition you might as well just walk in and have a look. This way you don't have to travel somewhere special.

2.7. Flexible working

The new way of working, called flexible working, involves flexibility of location, times and offices. No longer are we required to settle in one office, but be on the move, in a public place or at home. This way you can plan your own schedule, no longer wasting time in traffic jams, because people can travel at their time. Expensive offices are no longer needed, because we work in public spaces. If we need to have a meeting we can rent a room somewhere, this can be midway, so that everyone needs to travel the same distance. Renting a room will be less expensive than buying a building. If you own a building there are also additional costs like maintenance, cleaning, all factors that create a nice work space. While if a room is rented, we need to just visit and go away, there is no need of maintenance. You can create such rooms easily in a multifunctional building. This does not have to be in the centre of a city, the only requirement is that it should be easily accessible to visitors.

3. Carbon credits earned from building material

Building material	Building space (m ²)	CO ₂ /m ² (kg/m ²)	Carbon Equivalent CO ₂ e (Ton)	Euro (5/tCO ₂ e)
Concrete	7,000,000	550	3,850,000	19,250,000
Steel	7,000,000	620	4,340,000	21,700,000

The use of concrete results in 550 kg/sq. m of carbon dioxide whereas steel results in 620 kg/sq. m ([Concrete CO2 Fact sheet, 2015](#)). The carbon credit is taken as 5 Euro per tonne of Carbon Equivalent (5/tCO₂e). ([Daniel Buche, 2015](#)) The total carbon basin amounts to 3,850,000 and 4,340,000 of tCO₂e for concrete and steel, respectively. The carbon credits that can be earned from saving construction through concrete and steel is 19.25 million Euros and 21.7 million Euros, respectively.

3.1. Carbon credit earned from energy saved

Building material	Energy saved (Gj)	CO ₂ /energy (tonne/Gj)	Carbon credits (tCO ₂ e)	Cost for carbon exchange (5 Euro/tCO ₂ e)
Concrete	43,750	0.23	4287.5	50312.5
Steel	1,617,000	0.23	371,910	1,859,550

The construction industry requires a huge amount of energy. This energy is generated using a number of fuel sources, resulting in a large amount of carbon dioxide emission. One Gigajoule (Gj) of energy will result in 0.23 tonne of carbon dioxide (CO₂). (<http://www.co2list>.

[org/files/carbon.htm](#)). The energy required for concrete and steel construction is 2.5 GJ/metric tonnes and 30 GJ/metric tonnes ([Concrete CO2 Fact sheet, 2015](#)). The total carbon emission from the energy required is 4287.5 tCO₂e and 371,910 tCO₂e. The carbon credits that can be generated through saved energy are 50312.5 Euros and 1.85 million Euros in terms of concrete and steel.

4. Scenario in developing countries

As for considering the scenario in developing countries viz. India and Saudi Arabia, this problem is not considered as still more built up space is required to meet up the future requirements. For planning of the Delhi Master Plan 2021, 2 million residential units were required by 2021 to accommodate the increasing population of the city. The government met 1 million units by increasing the permissible height of the building proving that more residential units could be provided without any land requirement. But the remaining 1 million residential units are still lacking. The capital city of New Delhi is not able to provide enough land space. So it relies on its neighbouring state's new development area NOIDA to meet up the requirement of 1 million units. NOIDA and Greater NOIDA have empty building spaces on a large scale but with a 1 million requirement still needed by its neighbour will have to do the needful.

The Kingdom of Saudi Arabia is having the same scenario but viewed in a different context. For instance, the Holy Cities of Mecca and Medina and their population expansion is the result of an increased number of pilgrims. This has resulted in an increased requirement of Hotels, Restaurants, Business centres etc. The tourist locations such as Abha, Al Baha, Tabuk, etc. again need more building spaces to meet up this requirement. One of the major features which affects the requirement is that the old buildings are constructed in traditional styles so new buildings are required in all the requirement scenarios when it comes for residential purposes.

5. Discussion

An office had been successfully transformed to be used as a bank, because the office was too big and could also be used as a bank. (Diemen – Wilhelminastaete) The study concludes that instead of transforming a building for a particular and unique use it should be transformed for a number of uses making it multi-functional. We take for example a 3 storey building where the ground floor is rented out and used as a coffee bar for easy access to flexible working spaces with some cabins or rooms for private meetings. The first floor can be converted into an old age home and a security check at the stairs and lift will take care that there is no public rush at the old age home. The second floor can be given to students who need accommodation and a peaceful atmosphere of an old age home provides a good environment to study and elderly people get to see young blood around them making them feel a part of the society.

The only hurdle which lies between these transformations is finance. No one wants to invest in it either the public or the government. To transform a building takes time, there needs to be a vision and a mission. Someone has to come up with a plan, the plan has to be approved by the municipality, there needs to be someone who can finance it and the owner of the building has to agree. When all factors are arranged it is possible to actually accomplish the transformation and create an environment and its conservation will also need finance. The carbon credit generated can provide a much a needed support for the transformation of such spaces.

6. Conclusions

The solution to the problem is the responsibility of both the government and the individual collectively and it can be worked out. The study concludes that the present problem of vacant office space has potential of future sustainable development with a little thinking.

The study has converted the very problem of empty buildings or empty spaces into the very profitable resource. 20 million Euros of funds can be generated through carbon credits, which is solely the work of government and the generated funds can be invested in building transformation. At least we can start with a small transformation of space instead of whole 7 million square metres at one time. If we succeed then the rest of the vacant spaces can be organised accordingly.

The multi functional buildings and a flexible style of working will solve most of the problems preventing the building space transformation.

The Netherlands has come up with a law to fine individuals whose property is unutilised for a specific period of time. The developing countries should include the law for utilisation of property within a specific period of time to avoid any problems in the future.

Though the developing countries are still not facing the problem of empty building spaces but sooner or later the bigger cities like New Delhi, Mumbai, Jeddah, Riyadh, etc. will be facing it. Even if not faced the proper and efficient utilisation the buildings will not only avoid the problem but will make the buildings more efficient. The laws like Netherlands should be introduced in the developing countries in the present time to deal with future problems.

The Master Plans for the development of cities should incorporate empty building spaces as a problem to be solved and then implemented. This will prove to be more effective and efficient as planning one step at one time will also solve some of the problems that will be faced in the very near future.

References

- Amounts of CO₂ Released When Making and Using Products, 2014. The CO₂ list.org. Available online at: <<http://www.co2list.org/files/carbon.htm>> (accessed 15.12.14).

- ANP (Algemeen Nederlands Persbureau), 2011. Leegstand kantoren neemt verder toe. De telegraaf [online] (last updated 12.13 PM on 26th July 2011). <http://www.telegraaf.nl/mijnbedrijf/10256166/___Leegstand_kantoren_neemt_verder_toe___html> (accessed 15.11.11).
- Concrete CO₂ Fact Sheet, 2015. NRMCA publication number: 2PCO₂. Available online at: <<http://www.nrmca.org/sustainability/CONCRETE%20CO2%20FACT%20SHEET%20FEB%202012.pdf>> (accessed 15.07.15).
- Daniel Buche, 2015. TopoGeo-2012. Available online at: <<http://www.carboncredit2012.com/site/index.php/carbon-credit>> (accessed 16.07.15).
- Zuidema, M., van Elp, M., 2010. Kantorenleegstand: Probleemanalyse en oplossingsrichtingen. Available at: <<http://www.eib.nl/files/files/Rapportage%20Kantorenleegstand%20EIB.pdf>>.
- Zwerfkei: Tijdelijk Beheer, 2011. Wet Kraken & Leegstand en Amsterdamse leegstandverordening. Available at: <[http://www.zwerfkeibeheer.nl/userfiles/Wet%20Kraken%20en%20Leegstand%20en%20Amsterdamse%20leegstandverordening\(2\).pdf](http://www.zwerfkeibeheer.nl/userfiles/Wet%20Kraken%20en%20Leegstand%20en%20Amsterdamse%20leegstandverordening(2).pdf)> (accessed 15.11.11).
- Further reading**
- Brown, B., Thiry, M., 2010. Sustainability “How-To Guide” Series: Turning Data Centers Green. IFMA Foundation, Houston, Texas. Available at: <www.ifmafoundation.org>.
- Burnett, J., 2006. Greenhouse Gas Emissions Comparison: Carbon Benefits of Timber in Construction. Forestry Commission Scotland, Centre for Carbon Management Ltd, Edinburgh.
- Cosaboon, C., Jarger, E.J., 2010. Sustainability “How-To Guide” Series: A Comprehensive Guide to Water Conservation: The Bottom Line Impacts, Challenges and Rewards. IFMA Foundation, Houston, Texas. Available at: <www.ifmafoundation.org>.
- Dols, L., 2011. Oriëntatie Facility Management. Academie Voor Facility Management, Haagse Hogeschool, Den Haag.
- Doonan, C., Volkman, J., et al., 2010. Sustainability “How-To Guide” Series: No-Cost/Low-Cost Energy Savings Guide. IFMA Foundation, Houston, Texas. Available at: <www.ifmafoundation.org>.
- Jay Enck, H., 2010. Sustainability “How-To Guide” Series: Commissioning Existing Buildings. IFMA Foundation, Houston, Texas. Available at: <www.ifmafoundation.org>.
- Lake, A., 2011. Introducing Flexible Work: The Range of Flexible Working Options. Available at: <<http://www.flexibility.co.uk/flex-work/index.htm>> (accessed 7.12.11).
- van Lookeren, F., 2011. Hoe is het om te werken in een leeg kantoorpark? <<http://www.intermediair.nl/artikel/organisatieveranderingen/280704/hoe-is-het-om-te-werken-op-een-leeg-kantoorpark.html>> (accessed 15.11.11).
- NRMCA, 2008. Concrete CO₂ Fact Sheet. Silver Spring: National Ready Mixed Concrete Association. Available at: <www.nrmca.org>.
- Portalatin, M., Koepke, K., et al., 2011. Sustainability “How-To Guide” Series: Green Building Rating Systems. IFMA Foundation, Houston, Texas. Available at: <www.ifmafoundation.org>.
- Regterschot, J., 1988. Facility Management: Het Professioneel Besturen Van Kantoorhuisvesting. Kluwer Bedrijfswetenschappen, Deventer
- Roskoski, M.K., Gilmer, L., et al., 2009. Sustainability “How-To Guide” Series: EPA’s Energy Star Portfolio Manager. IFMA Foundation, Houston, Texas. Available at: <www.ifmafoundation.org>.
- Russell, R., Albright, B., 2008. Federal Research and Development Agenda for: Net-Zero Energy, High-Performance Green Buildings. National Science and Technology Council: Committee on Technology.
- Suzuki, M., Oka, T., et al., 1995. The estimation of energy consumption and CO₂ emission due to housing construction in Japan. *Energy Build.* 22 (2), 165–169, Elsevier b.v.
- Tathagat, T., 2011. Green building policy and codes. *RE Feature* 4 (5), 24–27.
- Yttsma, W., 2002. De vele gezichten van Facility Management. Kluwer, Alphen aan de Rijn.