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Dutch Healthy Green Cities, By Citizen Group Contribution

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Abstract: Green roofing in cities is the new development in making cities healthier and more liveable. A striking example is the case of Chicago where air pollution was reduced by creating green roofs on all municipal buildings since 2006. A contrary development is the large-scale growth of cities by which leftover open space by compaction becomes used at the expense of green surface. Cities have enormous differences on green space square meters, not only due municipality policies, citizen initiative is involved too because their choices for greening of open public space and building roofs are decisive for the square meters reached, by individual and group behaviour. Therefor research is done on action-prospects that can create a break-through in greening cities. An inventory is made of greening activities of citizen groups in the Dutch situation; their motivations included. Results from former research on sustainable citizen group participation have been used as foundation of the citizen group dynamics encountered. The conclusions are that: 1. There are more initiatives with more impact in cities then in the countryside, 2. A third of the green initiatives are food production motivated, 3. For the citizen-initiative participants liveability in general is a more important motivator then sustainability, and 4. The square meter impact of green citizen-initiatives in cities is little. Action perspectives are: stimulate food related citizen initiatives [quantitively], and vertical faced greening [qualitatively].

1. Healthy cities by green square meters [research questions]

Green roofing in cities is the new development in making cities more healthy and liveable (Kahn, 2007). Green space in cities and around people is good for the health of citizens (Zhang et al., 2015) and for their emotional welfare (Wolch et al., 2014). With the increasing trend of a drawing-back government due to budget cutting and a change of Dutch governmental load balancing of responsibilities with the people, the importance of 'Green initiatives of the commons' are clarified.

Positive prosper signals confirming this statement do come a number of institutes form anywhere in the world. The US GSA [General Service Administration] supports green roofing because plants do clean the air by filtering fine dust, facilitate water storages in cities and give the city people nice areas to walk along[1]. Like the Dutch 'Green City' organization promoting the increase in green areas in the Netherlands; because of the wellbeing of city people. Green should according to this movement be seen as nice to live in with a beautiful sight, provided that this is taken into account in the architectural design and the urban development setting[2] (Washburn, 2013).

An inventory study of green surface advantages executed by this institute divides the effects in physical, security of existence and social results. Advantages mentioned are: cleaning of air, slowing down rainfall retention peaks, quality of wastewater, heat stress reduction, noise reduction, CO2 reduction as well as food production, social contacting and identity are mentioned (Hop and Hiemstra, 2013). Green roofing' focus shows to develop too; were wellbeing and rainwater storage of first importance; reducing heat stress, food production and stimulating biodiversity are added to these recent years (Klemm et al., 2015). A striking example is the case of Chicago where air pollution was reduced by creating green roofs on all municipal buildings stimulated by Mayor Daley since 2006 (Birch and Wachter, 2008), see picture 1 for an impression.

[1] https://www.gsa.gov/about-us/organization/office-of-governmentwide-policy/office-of-federal-highperformance-buildings/resource-library/integrative-strategies/green-roofs
[2] www.thegreencity.com

Figure 1. Impression pictured of Chicago green roofs and vertical facades in the Netherlands.

Scientific studying though focuses on the positive effects of the green roofing in general, like research on pollution reduction (Yang et al., 2008) and CO2 reduction (Li et al., 2010), not quantifying the roof square meters needed for making cities healthy. According to the Dutch ECN institute the transformation of only 10% of the hardened city surface into green area, already creates breakthrough positive effects on the; temperature regulation, air quality improvement, noise reduction, and give providences for water cleaning regulation, stimulating mental health, physical activity and social interaction (ECN, 2016). Still this study too quantifies effects on cities instead of quantifying the needed square meters for making a city like Chicago healthy for the citizens and its biotope.

The development of vertical green facades makes the quantifying of the square meters needed extra complex. Vertical and horizontal greenery have different effects; vertical green facades facilitate less rainwater storage the square meter for instance, although buildings do count more vertical then horizontal square meters normally. Most of recent research focuses on the comparison of greenery construction methodologies and the difference in between vertical and horizontal impacts. For a countable proposition there is to less research available yet.

A contrary development is the large-scale growth of cities; as the world population in cities is forecasted to grow from 54% in 2014 to 66% in 2050 (UN, 2014b); what makes the UN Paris sustainable goals a matter of cities mainly; and what makes urgent creating a healthy and liveability living environment for people by green surface by city planning (Gómez et al., 2010).

Although leftover open space by compaction is actively used for new housing at the expense of green surface neighbourhood park areas mostly (Oliveira et al., 2014). The reduction of car ownership in cities and the increase development of e-car pooling (Firnkorn and Müller, 2015) facilities new free space for housing development, what makes the buildable surface larger, facilitating the population growth of cities (UN, 2014a) (UN, 2014b).

A positive prospect is the development of citizens embracing the green city developments (Sanders and Van Timmeren, 2017); whereby many of the new green initiatives in cities show to be founded on civilian initiative more then municipality policies.

What all makes the urgency and feasibility for vertical and horizontal greenery developments for compensation a more important challenge to be stimulated. What opens as the essential research question for making cities healthier; a question facilitating sustainable and liveable cities for the future:

CENTRAL RESEARCH QUESTIONS;

'What is and can be; the citizen initiative greening contribution, qualitative and quantitative'

For answering this research question; the situation of green city surface is worked-out by literature search [chapters 2 and 3], secondly as new research an inventory of Dutch green citizen initiatives is executed [chapter 4], followed-up by an explanation of the dynamics of citizen's initiatives [chapter 5], and the international state of development [chapter 6] both by literature review; with conclusions and remarks in a concluding exposé [chapter 7].

2. Dutch green cities 'state of art' [introduction]

In the Netherlands greening programs are operational started-up in recent years; programs of different content, scale and in the hands of different actors, mostly initiated by national and local governments though. Based on Internet search three development-lines can be distinguished: 1. Initiating new forestry in new areas by national government, 2. Stimulating green roofing by municipalities in cities, and 3. Small-scale greenery initiatives take by citizen groups often food related.

In the Netherlands forestry existence is stimulated for recreational use in special, and in combination with nature conservation and wood production, as well as for reasons of sustainability nowadays. By national government in 1984 a long-term policy for the increase of the forestry areal was started. According to regularly measurement the forestry areal has increased on average with 0,8% every 10 year; in the period 2004 to 2014 from 370k to 373k ha. [hectares: 10k m^2], being 0.3k ha/year; and 11% of the country's surface average (Schelhaas et al., 2014). For speeding-up this growth figures the governmental forestry department [www.staatsbosbeheer.nl] with partners [www.coalitiebosenhout.nl] plans to build an additional 100k ha. of forest spread over the country in open agricultural surface in between cities [locations: Groene-hart, Gelderse rivierengebied and in the Veenkolonien Drenthe].

Secondly, the larger municipalities in the Netherlands developed their own stimulating policies to increase the green roofing surface in the coming years. There shows to be yet no approach to measure the total area and follow the development. The most active are the three western cities: Amsterdam, Rotterdam and Utrecht.

The Amsterdam city for instance, its policy is to green a third of all the city roofs. Therefor it received a stimulating EU subsidizing for creating 10k m^2 green roofing with the city's social housing companies. The preliminary goal of Amsterdam is 1,200k m^2 to be realized in 2020; by the RESILIO project initiative of the municipality: https://ivm.vu.nl/en/news-and-agenda/news/2018/okt-dec/resilio-project-smart-blue-green-roofs-on-Amsterdam-social-housing-buildings.aspx; 0.06k ha/year.

The result is that in Amsterdam the surface of green roofs has doubled in the years 2015-2016 to 40k m^2, being 0.1% of the total city capacity of 45,000k m^2 that can theoretically be made green; with 'Rooftop Revolution [a crowd-fund initiative] and the 'Knowledge Mile park Zuidas' the most known projects. Most of these projects are initiatives of local residents that create a gardenlike park on the roof of an office, see figure 2 and https://maps.amsterdam.nl/groene_daken/?LANG=en.

Figure 2. Amsterdam green projects: 'Rooftop Revolution' and 'Knowledge Mile Park Zuidas'.

Thirdly; the number of citizen initiatives greening their roofs is increasing steady in recent years, in all of these cities nationwide. The diversity of initiatives is large, the scale of the projects is small, and it mainly concerns private initiatives; house owners that create a garden on their roof. Occasionally occupied housing owners combine their forces to create a green roof in collaboration, as in the Western district of Amsterdam where 89 households created 1.2k m^2 green roof in spring 2018 in togetherness: https://www.groenedaken.amsterdam.

By taking Amsterdam as a business-case; the combination of results and prospects raises the question whether the municipality policy will reach the targets. With the current progress of development Amsterdam will, based on a little match, reach the 2020 goal in the year 2140, 120 years later; assuming that the development on private roofs stays relatively small. Is this the situation, a city like Amsterdam

will have to get the green surface development from the forestry sector, and for that reason the possibilities are juts on the outskirts of the city, while the challenge, as with regard to heat-stress reduction for instance, lies in the centre. What makes it urgent for speeding-up the success of green roofing in cities, to learn more from the potential of cities initiatives into city green roofing, underlining the research-question of chapter 1.

3. Making Dutch city green surface measured [situational sketch]

At Wageningen University in the Netherlands a benchmark is executed to make municipality green surface calculable [www.benchmarkgroen.nl], the numbers present square meters municipality green surface for the largest 31 Dutch cities [31 out of 380], executed by the 'Wageningen Environmental Research' institute for facilitating municipality green surface policies. The work is done by GIS analysis in combination with air photo interpretation. At the start only the larger surface areas were measured, followed-up by more precisely measuring taking private gardens and small green ribbons into account (Bezemer et al., 2002) (Visschedijk and Huizinga, 2009).

By analysis there is focused on quantitative and qualitative differences for creating deliberative conclusions according to the availability of green areas in cities [quantitative] and the difference typologies related to accessibility [qualitative] using the Middelkoop conceptual model (Middelkoop et al., 2001). The national norm is used as reference; that city green should not be less then 75 m^2/house in cities (Bervaes et al., 1996).

The difficulty of this inventory showed to be taking in account the right green areas; small spots were difficult to make observations of, and a number of cities studied had their green areas situated outside the official city boundaries. Therefor the research of 2002 is updated in 2009, and a comparison is made by taking zones of 500 and 1,000 meter outside these boundaries into account as alternatives. In the 2002 research special analysis is made focussing on 10 cities out of 31, to make the differences of cities clarified. With the research of 2009 all the 31 cities are worked out and deprived neighbourhoods are analysed separately.

For the Dutch situation these research results give a picture of the green surface in cities quantitatively with a qualitative deepening, and therewith due to the work of Wageningen University a reference for the contribution of green surface planning. The results are given picture in the figures 4 and 4.

The results are that in 50% of the Dutch cities the average measured green surface is lesser then the norm of 75 m/house. This 50% reduces to 10% when a zone of 1,000 meters more around these cities is taken into account too, then 90% of these cities meets the standard of 75 m^2/house. Aside note with this positive result is that it seems that in general; the inner centrum of these cities have much less green surface then the outer neighbourhoods, with exception of most of the deprived neighbourhoods.

These deprived neighbourhood show to have much less green surface, lesser then 67.1 m^2 in general, and a 50% of these neighbourhoods score les then 50 m^2/house. An important qualitative factor seems to be accessibility; in most of these cities a large extent of the green surface is not accessible to anybody, as there are forest areas, sport facilities and agricultural fields.

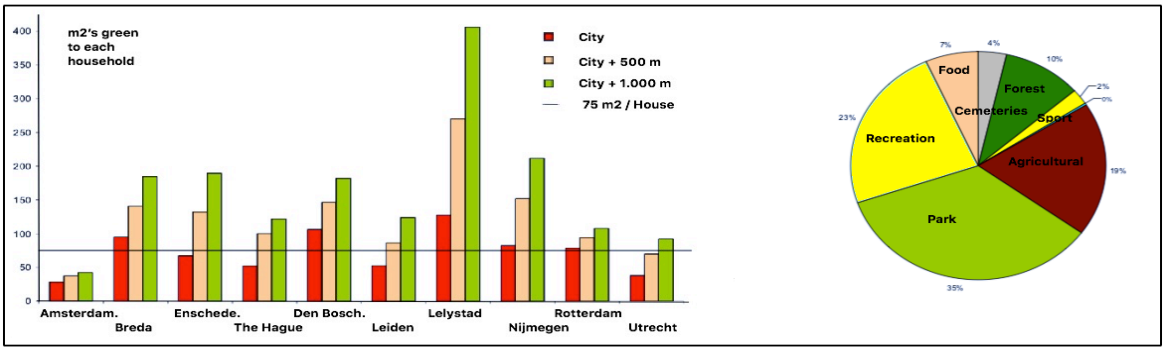

Figure 3. Dutch cities G31 selection; m^2's green and typology diversity

A comparison of the two largest cities of the Netherlands, Amsterdam and Rotterdam, shows the greatest differences of all these cities; Rotterdam has almost three times greener surface then Amsterdam, a difference that becomes even greater when the outer area of 1,000 meter becomes included, although Amsterdam has relatively more accessible park and recreation are. See figure 3. What shows and proves that the qualitative site of green area is as much important as the quantity.

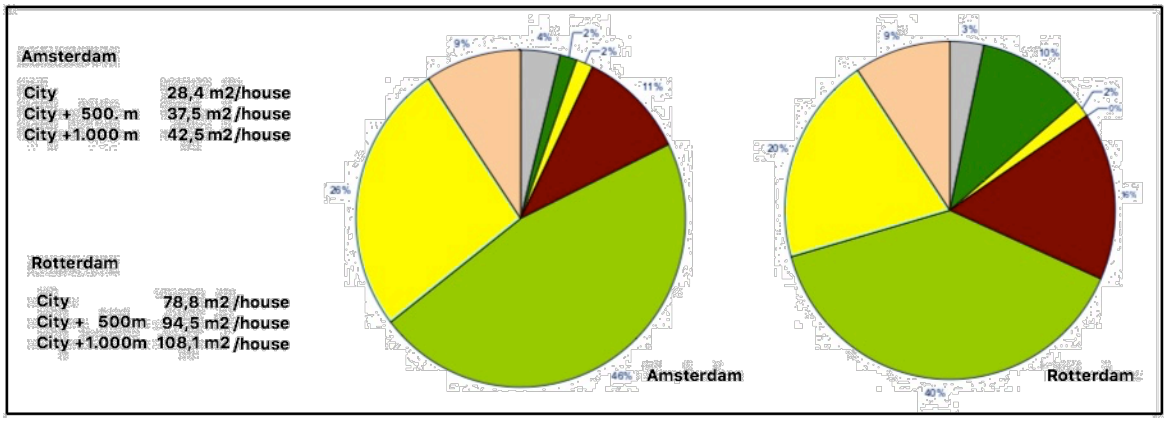

Figure 4. Amsterdam and Rotterdam comparison; m²'s green and typology diversity

The positive message is that the green surface in the 31 measured cities have increased in the seven year in between the measuring moment of 2002 and 2009; a plus 3,5 m²/house. Therewith there in these reports is concluded that the national policy to stimulate the increase of green city surface works. With the remark at the other hand that this growth does not facilitated the deprived neighbourhoods of these cities, neighbourhoods that according to other governmental policies do need positive impulses.

The official goal in the Netherlands by government for green surface in cities is 75 m²/house, starting from 2.5 persons in Dutch households average this goal is equal to 30 m²/pp. The green surface availability in the greater G31 Dutch cities; shows to be 50 m²/house, 20 m²/pp average, not taking into account the area directly outside the city boundary. What appears to be a high target in comparison with the minimum requirement of 10 m²/pp used by 'Fuller and Gaston' by their presentation of green surface availability in EU cities; the Dutch target is 3 times more, from which 2 times more available in 2018.

4. The 2018 Dutch city green civilian initiative inventory [research]

In 2018 an inventory of green initiatives taken by civilian groups is executed, by making use of the provisions of the 'maex' organisation, using as a tool the www.maex.nl website. This website is launched in 2015 to facilitate civilian initiative groups with mutual learning. The underlying concept is that civilian groups are invited to place their initiative on a map of the website, and upload data of the initiative to be published, to invite other initiatives to make contact and share experiences and lessons learned. Implicit all these uploaded initiatives deliver an inventory, a detailed overview of the civilian initiatives in the Netherlands, clustered in themes with the societal effects made visual.

For instance, on the 31th December of 2018, there were 1,589 initiatives signed up, with average 40 hours volunteer work a week active, through which 3,267k people in the Dutch society are reached. The 'maex' themes are: Care, Cohesion, Culture, Development-aid, Education, Elderly, Emancipation, Green-infrastructure, Housing, Inclusion, Integration, Labouring, Liveability, Mobility, Neighbourhoods, Security, Shrink-areas, Sport, Sustainability, Vitality, and Youngsters.

Zooming in on the 'maex' theme 'Green-infrastructure', at the end of the year 2018 this theme counted 89 civilian initiatives. These are analysed for answering the second central question; 'the quantitative and qualitative contribution to greening cities by civilian initiative'. Relevant it is to what extent this inventory is also decisive for the situation in the Netherlands. However, there are no comparable

inventories for checking its reliability. What can be indicated as an argument of reliability is that the growth in numbers of civilian initiatives registered on the 'maex' website over the last two years had slowed down, what can be seen as a sign of saturation, knowing that the maex organisation checks periodic every three months, if the initiative is still alive.

The inventory of 'green infrastructure' civilian initiatives is analysed in two ways; 1. A distinction has been made between urban and countryside initiatives, 2. Within this, a distinction has been made between the sub-themes: 'Green', 'Food', and 'Social', being the reasons given by the promoters on the 'maex' website for taking their initiative, see tables 5 and 6.

Green civilian initiatives	Cities		Countryside	
Numbers	68	76%	21	24%
Square meters a number	19,150	86%	3,048	14%
Total of Square meters	1,302,000	95%	64,000	5%

Table 5. The 'maex' Dutch civilian initiatives subdivided to 'cities' and 'countryside' [31.12.18].

Green civilian initiatives	Green	Food	Social	Total
Numbers	54	35	[5]	89
Numbers in percentages	61%	39%	[6%]	100%

Table 6. The 'maex' Dutch civilian initiatives subdivided to 'green', food' and 'social' [31.12.18].

This analysis shows the following results:

1. Most of the green civilian initiatives happen in cities [76%].
2. The size of the green surface in cities is far larger than in the countryside [6,3 times].
3. Green citizen initiatives in cities are decisive for creating green surface in the country [95%].
4. As reasons for these initiatives besides 'green' there is 'food' [61 and 39%].

Remarks that have to be made:

1) For 6% of the initiatives 'social' was mentioned besides 'green' and 'food'.
2) The by civilian initiative created m^2's are no year results; these are cumulative m^2's.

5. The development of green cities globally [literature search]

The practice of inventorying and measuring green surface in cities has not yet been standardized globally, what can be concluded from literature search. Most of the inventory systematics not only measure green surface, but also involve sustainable goals as renewable energy and reducing CO2 emission inseparable with it, like Brilhante and Klaas do by making their HIS 'Green City Performance' standard (Brilhante and Klaas, 2018). The Eco-watch 'green healthy cities' ranking [www.eco-watch.com] for instance does focus on climate-change leadership, efficiency sectors, markets and environment and natural capital called 'green' and not on 'green' surface facilities, as well as the 'World economic Forum' [www.weforum.org], the 'US Green building Counsel' [www.plus.usgbc.org] 'Top Green city' rankings, the European[3] and Asia[4] 'Green City Index' [GCI] do.

These ranking still use the quantity of green surface like parks and green roofs on buildings as one of their variables, from-out the starting-point that green area in cities is good for the healthy and the liveability of the citizens (Kahn, 2007). Starting from the European and Asia GCI's; the scoring cities are

[3] https://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_en.pdf

[4] http://sg.siemens. com/city_of_the_future/_docs/Asian-Green-City-Index.pdf

Istanbul [6.4 m²/per person], Tokyo [3.0 m²/pp] and Buenos Aires [1.9 m²/pp]. Cities that score the best are Singapore [66 m²/pp], Stockholm [87.5 m²/pp] and Vienna [120 m²/pp].

The 'World Health Organization' [WHO] is planning to set a standard for the minimum of green space in cities with the 'Green-S+' project in 2019. Like 'Fuller and Gaston' introduced the standard of green in cities that should be more than 2% of the country surface (Barker and Graf, 1989)

From the UK there is a standard that sets that the minimum of green surface in cities should be 10 m²/pp (Fuller and Gaston, 2009); a far more milder standard then the Dutch national governmental standard of approximately 30 m²/pp assuming 2.5 person per household in the Netherlands. An inventory of green space in Europe cities based on these 10 m²/pp standards, shows approximately that 40% of the Europe cities match this city standard, spread over the continent, and most of the southern countries do not match the countryside standard; see figure 7,

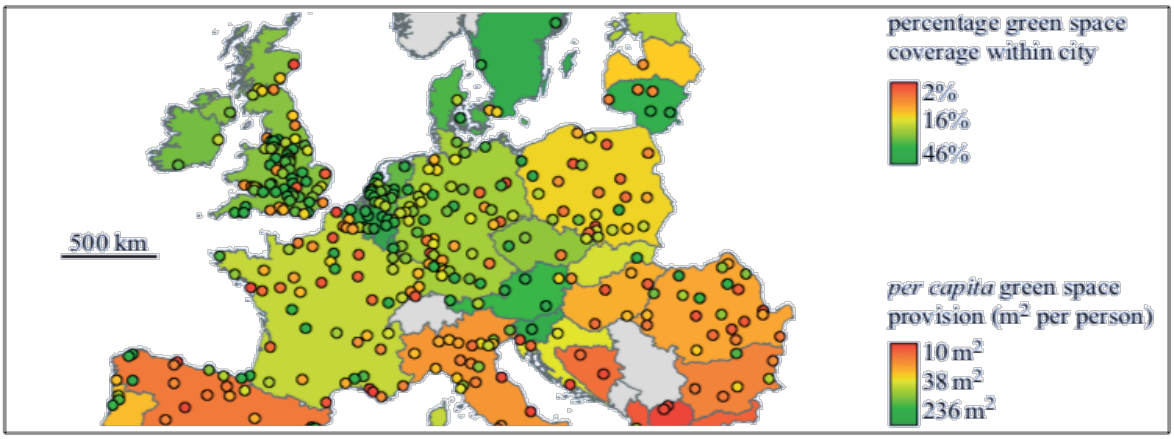

Figure 7. Percentage of green space within cities for Europe (Fuller and Gaston, 2009)

6. The role of people in making city surface green [body of knowledge]

In 2018 by Delft University of Technology in cooperation with the city of Delft, research is started for making clear how the Delft citizens can be tempted to invest in green surface area. The underlying observation is that people are looking up to the hassle, called the 'hassle-factor' [Dutch: gedoe-factor].

According to results of Sanders' dissertation though; in the triangle relation of the intense relation of 'Dutch Government with the Technocratic Sector' with the Dutch people individually and organised, the Dutch people have less difficulties of acting sustainable as investing in green, their barrier for acting lays in the not stimulating relation with government and its partners.

In general citizen group initiatives seems to flourish when their household base is on order, when the group is searches social togetherness instead of bonding and when the municipality facilitates the small scale of such initiatives (Sanders, 2014). Citizen group initiatives differ much in their goal setting and involvement though, that's why difference is found in between passive and active citizenship (Tonkens, 2009) (WRR, 2012) related to the ladder of participation (Qu and Hasselaar, 2011).

There will be only collaborate with the Dutch people into the national sustainable goals if the professionals of government and its related parties, when they take the perception of people and their kind of action-prospects into account in their actions and policies (Sanders, 2014). This because people work with motivation on short-term goals coupled to the people and prospects of their direct home surroundings, while professionals deal with complex long-term goals linked to large scale of cities mostly, see figure 8.

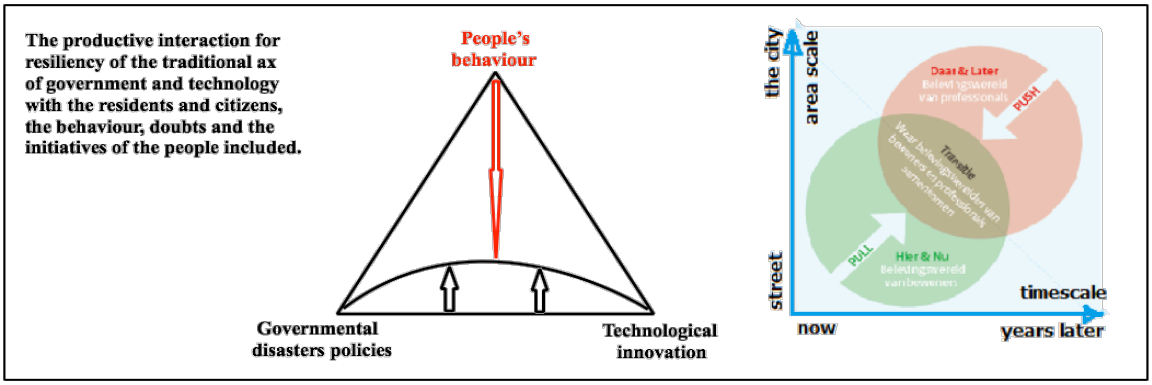

Figure 8. Visualization showing the sustainable collaboration of professionals and citizens.

Additional research on the Dutch 2010 innovation program for speeding-up the transition of cities towards climate neutrality 2010 [IKS] (Ministerie-VROM, 2009) [This program contained 20 projects [IKS1] from which 8 projects ended-up in project realization [IKS2] being innovation project realistic enough for execution and 4 projects concerning neighbourhood coupled renewable-energy sustainability initiatives, proved that professionals and citizens collaboration to the best in the action-models: Thinking-along [a passive civilian-ship, civilians reflect and advice by accepting governmental initiatives] and investing-in [an active civilian-ship, civilians take responsibility for initiatives dealing with government]. Joining-in as a model [a passive civilian-ship, civilians participate in and support government initiatives] showed to be less productive (Sanders and Timmeren, 2016), see figure 9.

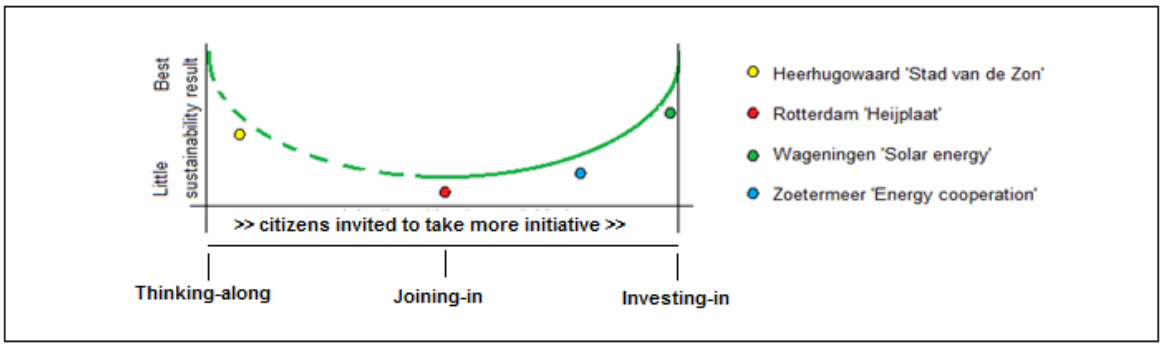

Figure 9. Visualization of IKS research sustainable collaboration models professionals and citizens.

For more focus on success factors for taking green citizen initiative, more additional research is done; by comparing the Amsterdam and Rotterdam situation in 2017. Thereby the green initiatives of Amsterdam and Rotterdam are questioned; on the motivation of the citizen's group, their relation to the municipality, their prospects for the coming years and their needs for continuity.

The conclusion of this research was that Rotterdam is the Dutch city with the greenest citizen initiatives, because the municipality in its role for stimulating green initiatives shows to be primarily giving subsidizing, mostly as a start-up subsidize. In a few initiatives the municipality gave land in use for free often for a certain temporarily period. The municipality was also found as the window to get compensation financing for giving unemployed and citizen with mental handicap a sheltered working place. For most of the initiative these financial contributions were of major importance.

Secondly, he revenues earned by small community activities like cooking activities, selling home grown vegetables and fruit, doing advisory work to other initiatives, organizing excursions for other municipalities show to be just enough for continuing these green initiatives of the commons as they started, with volunteers and a dependency on subsidizing and donations. Only 25% of these green initiatives had a kind of financial business plan, which could explain that almost all of the initiatives do not invest for increasing their revenues out of their semi-commercial activities, A 50% of the green initiatives choose for that model out of conviction to keep their initiative of small scale on the scale of the neighbourhood they belong to (Sanders and Van Timmeren, 2017).

The conclusion of this research is that; 'Green initiatives of the commons can flourish better and last longer, when a strategic financial business case is made, managing less dependence of subsidizing on

the long run, by making the green factor of these initiatives more experienced to insure the contribution to healthy cities.

Based on the dissertational research on action-prospects for citizen initiatives in general, and the additional research on Dutch green initiatives in this chapter presented, there can be concluded: 1. Professionals from government and relates parties will only collaborate successfully when they manage overlap of interest and motivation for working together, 2. That for working together; the professionals or the citizens, give the other the initiative, 3. That the citizen initiatives have a kind of business-plan that they generate own revenues to not only dependent on municipality subsidizing.

7. Prospects for Dutch green cities development [conclusions]

The contribution of citizens in creating green surface in cities, has qualitative and quantitative aspects as included in the research question to be answered. Analysis of the www.maex.nl citizen initiatives inventory for Dutch cities is done; supplemented with literature search on the for healthy cities green area needed, and the dynamic of citizen initiatives; done for answering the research question with focus on the actual and developing quantity and quality in the context of city dynamics:

CITIZEN GREENING CONTRIBUTION; QUALITATIVE

Cities are increasingly being confronted with negative effects due to climate change, for which green areas offer compensation too; as there are cluster showers, air-pollution and heat-stress. The effect of a green surface is the greatest when the square meters are located in the centre of the city; however, the realization of greenery in the centre is difficult there precisely due to the need for new housing; due to city growth globally. Qualitatively giving focus on vertical green façade covering instead of besides horizontal greenery; can help to combine these two goals [chapter 1] (Luttik et al., 2014).

For the quality of liveability, the accessibility of green areas shows to be important for the citizen population; which advocates the construction of horizontal instead of vertical green surface. What explains the interest of citizen groups to embrace roof gardening in Dutch cities.

A motivating factor for citizen group initiative shows to be food production; the www.maex.nl analysis [chapter 4] proves that almost 40% of Dutch greenery initiatives are food production related; growing vegetables and fruit [chapter 6]. Analysing Rotterdam green initiatives confirmed that green initiatives into neighbourhood food production can enthusiastically embraced by citizens, in special when the produced food is sold in local stores (Sanders and Van Timmeren, 2017). Advanced research on this action-prospect is therefore recommended.

CITIZEN GREENING CONTRIBUTION; QUANTITATIVE

In the Netherlands the standard for city green surface shows to be ‘more’ then 75 m^2/house; a standard developed at the Dutch Wageningen University (Bervaes et al., 1996). Assuming the average of 2,5 residents a house for Dutch cities, this standard can be mentioned equal to 30m^2/pp. A standard much higher then used in the EU approach of Fuller & Gaston (Fuller and Gaston, 2009). A standard that many cities in the World do not meet; like Buenos Aires [1.9 m^2/pp], Tokyo [3.0 m^2/pp] and Istanbul [6.4 m^2/per person], and that is by other cities exceeded; like Singapore [66 m^2/pp], Stockholm [87.5 m^2/pp] and Vienna [120 m^2/pp] [chapter 5].

For enlarging the city green surface some cities like the Dutch city of Amsterdam have set green goals and have started subsidizing to stimulate green roofing; also, for compensating the loss of green surface to compensate for the urban densification for housing. These goals do not appear to be related to a percentage of urban greenery that should be achieved, these seem more geared to feasibility and finance ability. The square meters goal of the subsidizing program for instance; concerns only 2% of the city horizontal roof capacity.

Unless cities for creating new green surface are largely dependent on citizen initiatives; the contribution of such initiatives shows to be little. The Amsterdam green production by citizen initiatives for example was 20k m^2/year during the years 2015-2016, which is a negligible result per inhabitant. Based on the analysis of the www.maex.nl inventory [chapter 4]; the average contribution of citizen initiatives in making cities greener, is 0.026 m^2/pp yearly[1,302k/(5*10,000k; assuming a building-up period of 5 years and 10 million residents in Dutch cities totally]. Which more exactly confirms that the contribution of citizen initiatives is minimal

CONCLUSIONS IN GENERAL; ACTION PERSPECTIVES

- Despite the fact that European and city local objectives for promoting green space in cities are clearly present and that they are linked to clearly measurable objectives, these are only indicative formulated and not precisely linked to climate-change, healthiness and liveability counts. This should be a reason for further investigation.
- Unless many cities increasingly focus on the contribution of citizen initiatives their production creating green surface square meters; their contribution is little in relation to the goals that have to be achieved. What does not exclude that these initiatives will be a catalyst for citizen initiatives in a general sense; to stimulate making cities more social and sustainable. Because green and food related initiatives show to be in favour of the local citizens.
- Due to the limited contribution of greenery on roofs in the Dutch situation; it is advisable to also include the realization of greenery on the outskirts of cities in the urban objectives; and to save the accessible green zones inside the cities when the buildings areas are made more compact.

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