New Citizen Building Method
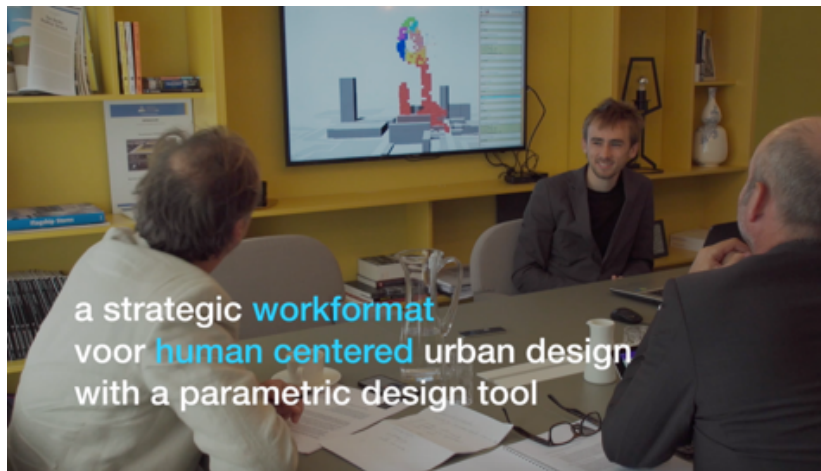An initiative of New Citizen Design & Professor Kas Oosterhuis
An original, multi-discipline method for urban design, development and building

a strategic workformat
voor human centered urban design
with a parametric design tool

Motivation

In the spring of 2017, Professor Oosterhuis and New Citizen Design started discussions on a new method of designing urban (transformation) areas and buildings. Their mutual interest was to combine twenty-first century priorities and challenges with a work format that serviced these, while simultaneously enabling different sorts of stakeholder representatives to collaborate on scenarios for urban design and architecture.

Priorities and challenges were met by the persona of 'the new citizen'. A persona created by New Citizen Design as the guiding principle of a design movement for spatial design. The positive energy of new citizens requires a more sustainable and future-proof method for architecture and urban design, placing human well-being at the heart of a development. This in contrast to traditional developments that focus more on the commercial value of area development.

Professor Oosterhuis's participatory urban design instrument provides a unique tool to use in the more human-centered design approach of New Citizen Design to achieve live-able cities and urban developments. In close cooperation with a consortium of specific professionals, a pilot was done to test and enrich the method and the instrument[*]. With the learnings of this pilot and after a series of demonstrations and interviews with professionals within the field of architecture, building, development and urban planning, the work format is now being launched to a wider professional public as the New Citizen Building Method. Important asset of the method is the use of Participator, the participatory urban design instrument developed by professor Oosterhuis.

Budapest / Rotterdam / Delft,
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[*] Consortiumpartners ONL, New Citizen Design, Arwix, cepezed projects, RHDHV. Real estate development company Manhave bv.

Participator, A Participatory Urban Design Instrument
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Paper adapted for Dutch Design Week 2020 – New Citizen Building
(edit. Antonia Wormer / New Citizen Design)

Abstract

A point cloud of reference points forms the programmable basis of a new method of urban and architectural modeling. Points in space from the smallest identifiable units that are informed to communicate with each other to form complex data structures. The data are visualized as spatial voxels [3d pixels] as to represent spaces and volumes that maintain their mutual relationships under varying circumstances. The subsequent steps in the development from point cloud to the multimodal urban strategy are driven by variable local and global parameters. Step by step new and more detailed actors are introduced in the serious design game. Values feeding the voxel units may be fixed, variables based on experience, or randomly generated. The target value may be fixed or kept open. Using lines or curves and groups of points from the original large, along the X, Y and Z-axes organized crystalline set of points are selected to form the shape of the actual working space. The concept of radical multimodality at the level of the smallest grain requires that at each stage in the design game individual volumetric units are addressed as to adopt a unique function during a unique amount of time. Each unit may be a home, a workplace, a workshop, a shop, a lounge area, a school, a garden or just an empty voxel anytime and anywhere in the selected working space. The porosity factor determines the number of empty non-specified voxels. The concept of multimodality [MANIC, K Oosterhuis, 2018] is taken to its extreme as to stimulate the development of diversity over time and in its spatial arrangement. The programmable framework for urban multimodality acknowledges the rise and shine of the new international citizen[*], who travels the world, lives nowhere and everywhere, inhabits places and spaces for ultrashort, shorter or longer periods of time, lives her/his life as a new nomad [New Babylon, Constant Nieuwenhuys, 1958]. The new nomad lives on her / his own or in groups of likeminded people, effectuated by setting preferences and choices being made via the ubiquitous multimodality app, which organizes the unfolding of her / his life. In the serious design game nomadic life is facilitated by real time activation of a complex set of programmable monads. Playing and further developing the participatory design journey was executed in 4 workshop sessions with different professional stakeholders, architects, engineers, entrepreneurs and project developers.

Keywords

Point cloud, voxel, working space, anytime, anywhere, multimodality, urban, nomad, programmable, monad, sliders, random, porosity, stakeholders, role play, expert, serious game, design game.

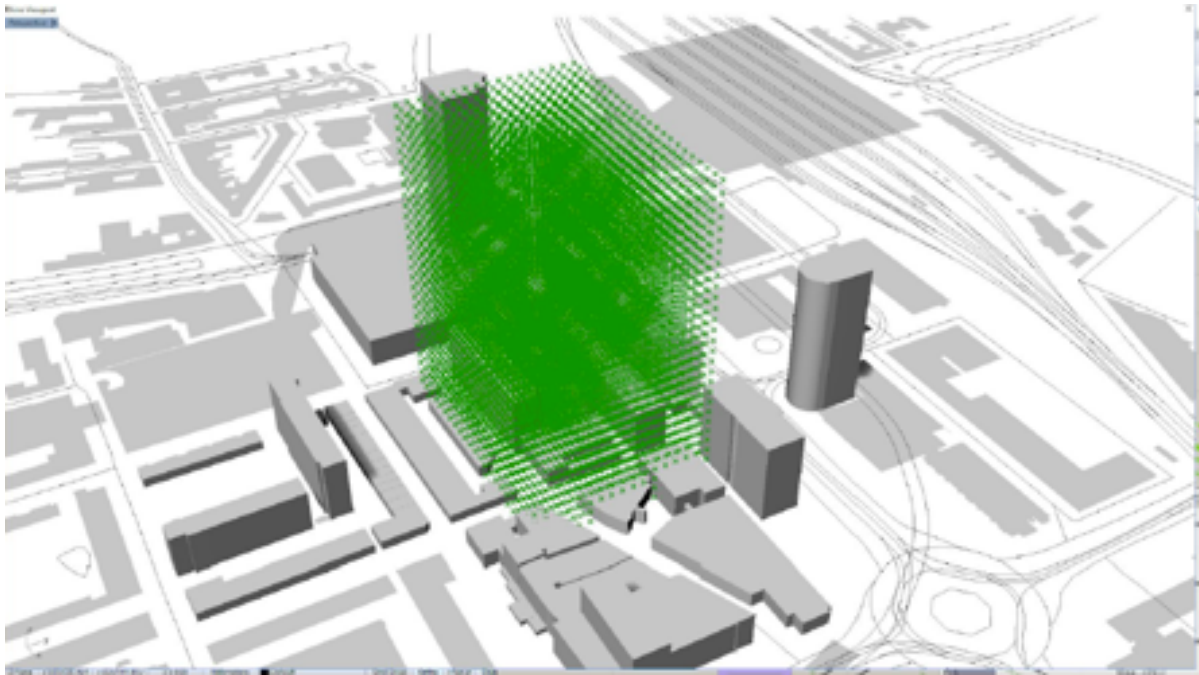[*] For a description of the persona of 'the new citizen' see end of paper.

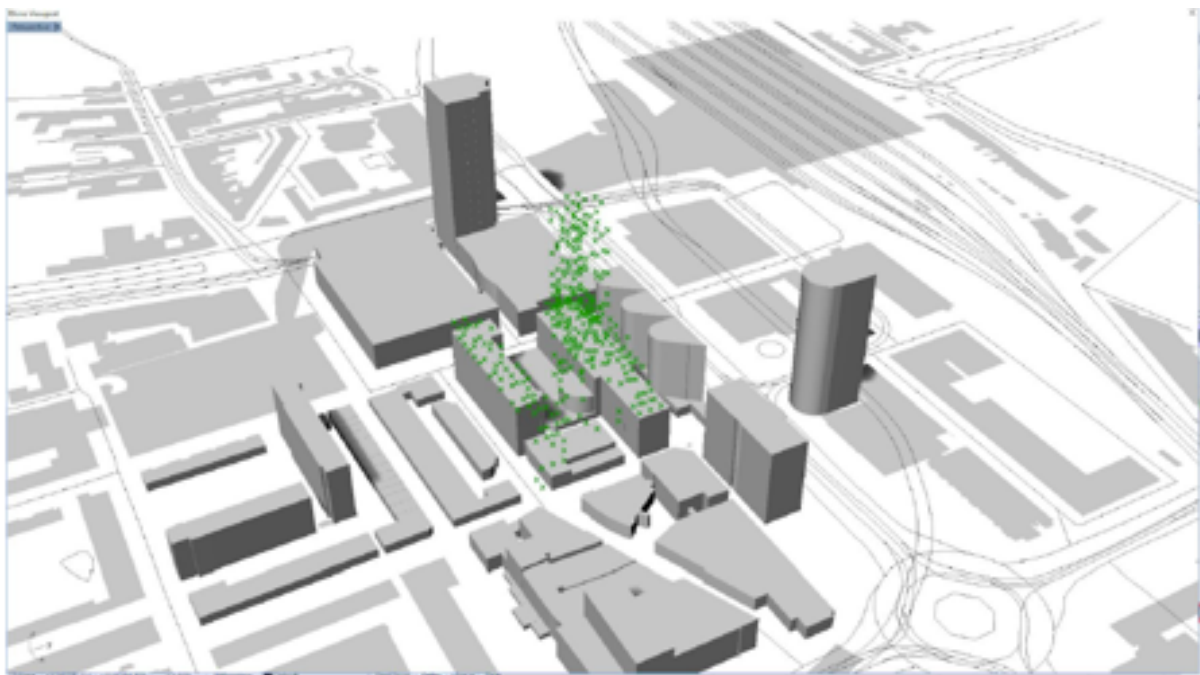Figure 1 | ONL | urban design instrument | 2018 | initial point cloud

Figure 2 | ONL | urban design instrument | 2018 | selected working space and random selection of reference points

The Point Cloud

The point cloud of reference points is chosen such as to encompass the totality of an urban block in the center of Rotterdam, The Netherlands. The height is temporarily fixed as a practical demarcation of the initial working space, the design game unfolds within this pixelated space. When we would need more space for expanding ideas or exploring potential more in detail, the initial working space would be simply enlarged or set to a higher resolution. The point cloud is intentionally designed to identify the smallest working unit, referred to as the "voxel", while the design game is set up such that each individual voxel, groups of voxels and all voxels can be informed to have any value or property. The distance between the voxels is chosen to match the size of the volumetric voxels that are in subsequent steps labeled as functional units.

The Shape of the Working Space

Freehand sketched or controlled straight lines are introduced to make the selection of points of the initial point cloud. By setting values for the tunnel of influence along the lines the selection grows or shrinks. The selected points are represented by a cube of 7.2 x 7.2 x 7.2 m, to function as the programmable urban unit, fit to be programmed by their future users. The freehand sketch affected pixels of the initial working space are represented as functional voxels. The selection of pixels crystallizes as a series of Participator, A Participatory Urban Design Instrument | Kas Oosterhuis et al. | 2018 connected voxels. The working space of selected voxels includes existing buildings as their repurpose and / or redesign may form part of the unfolding urban strategy. Due to the parametric nature of the system the design tool can be applied to different sites in a relatively short time. Selected pixels may be "baked" [from Grasshopper to Rhino] as a 3d model to form the basis for further modeling manipulations. In real time the effect of many different trajectories and thus the spatial outcome of different selection of voxels are explored in participatory workshop sessions with participating stakeholders, some of them experts in 3d modeling and design, others laymen with respect to modeling, being expert in other fields [financial, social engineering].

Porosity

To avoid the rigidity of the traditional close packing of predefined volumes, we have introduced the concept of porosity of the three-dimensional urban fabric as to stimulate 3d thinking and surprising spatial arrangements, thereby facilitating the diversity of needs and secret wishes of the nomadic international citizen [MIC]. Effectively porosity is represented using a randomizer to select the empty voxels. Selected voxels may seem to float in space when no voxel is selected under or besides the voxel that is assigned to a function. A porosity factor of 50% means that 50% of the selected reference points are visualized as cubes, in a random 3d configuration, the other 50% is left blank. Colors for specified voxels indicate the variety of functions, which are free to choose and to add: homes, gardens, workplaces, etc. In the urban instrument the voxels are assigned in a random 3d configuration, but in the further architectural design process these porosity voxels can be clustered together or any voxel can be assigned specifically to a desired location or configuration. The porosity voxels can be used to add voids, open spaces, etc. based on the architect's or client's wishes.

Serious design game

The programmable framework for the urban scale multimodality is designed as a serious design game, intended to involve stakeholders from different professional backgrounds as level playing field co-designers. A number of 4 workshop sessions with a selection of architects, entrepreneurs and engineers [companies invited to participate were Manhave, ONL, New Citizen Design (initiative), RHDHV and cepezed projects] were held at the office of project developer Manhave in Rotterdam as to involve the stakeholders in the urban design game. Different spatial arrangements were explored, alternately set by the project developer, the entrepreneur and the architect. Highly unlikely spatial arrangements were introduced to discuss mutual relationships between the assignment of functions to the voxels, helped the understanding of the full potential of the site, and certainly, broadened the scope of the project developer, as he became aware of the necessity to aim at long term strategy to facilitate the interlacing of private life and professional business of the new citizen. While workplaces become flexible, lifestyles become more complex and differentiated in time and space, the designers of the built environment will have to cope with these new developments and hence will invent new time-based and spatial arrangements. The programmable framework for the urban scale multimodality stimulates forward strategic thinking and as such has proven its urgency as confirmed by the stakeholders.
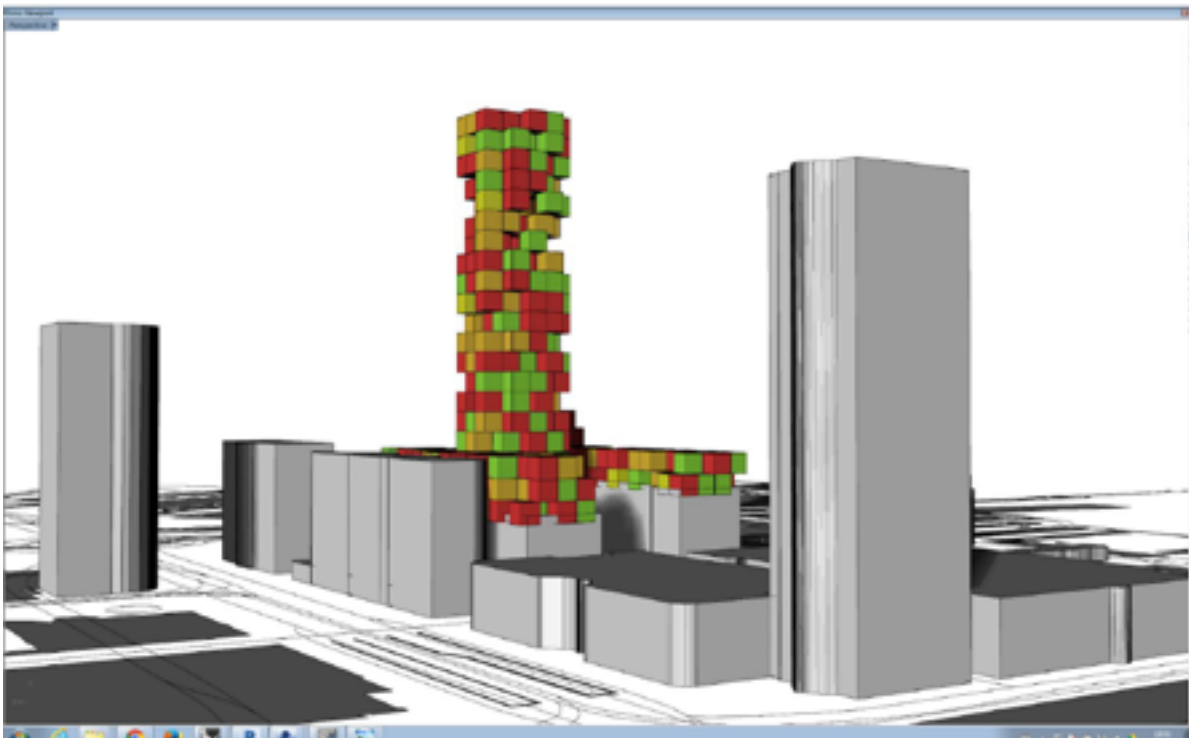

Figure 3 | ONL | urban design instrument | 2018 | random distribution of porosity and functions
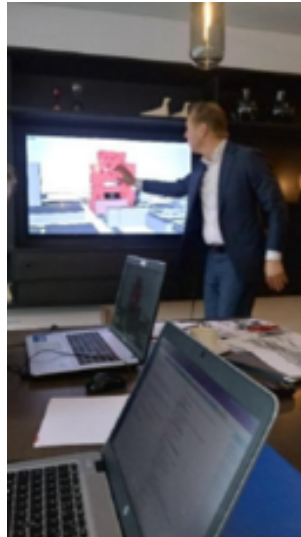
Figure 4 | Workshop session #3 | project developer Steven Manhave verbally interacting with the design game

Technical aspects of the parametric modeling strategy

The programming of the design game for multimodality was executed in Rhino / Grasshopper. The general strategy that was followed was to set global and local parameters driving the constituting modules. The sequence of specification that was followed starts with selecting active reference points from the point cloud's 3d array of reference points. Then these points are represented by a cube. Next step is to apply the level of porosity to the selection, whereas a randomizer selects the percentage of visible cubes. Furthermore, we have introduced attractors to attract certain functions. The strength of these attractors determines the number of affected cubes, positioned within the zone of influence of the attractor.
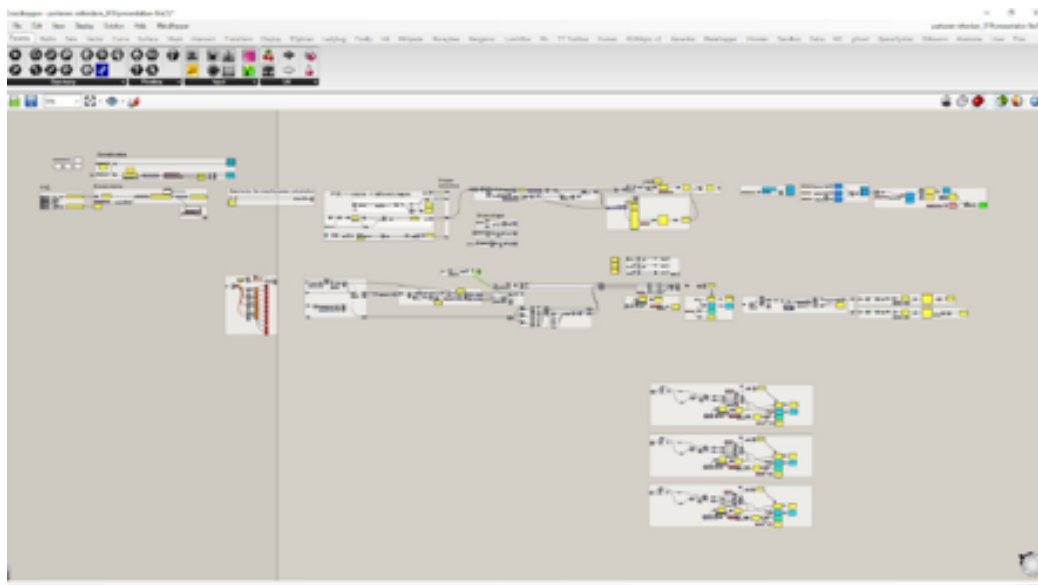

Figure 5 | ONL | urban design instrument | 2018 | programmable design environment

Calculation

Having chosen the selection, having set the porosity factor and having defined the function al zones, the script is augmented to support that many data can be abstracted from this model: total value of the selected voxels, surface area that is expo sed to the exterior, floor area, shared wall area, sorted out within their specified functions. Tweaking the parameters, an y change in the model is immediately recalculated to have immediate feedback from choices being made. The stakeholders can test their own choices and have feedback immediately, in its full transparency to see for the other stakeholders.

Costs

Subsequently a cost unit is connected to the voxels to calculate the costs of the volumes, surfaces and the total development, based on data from practice. The cost unit is designed such that we can fix the total available budget as a target value, allowing the stakeholders to be guaranteed stay within budget, whatever choices they make. In the later stages of the development specific costs have been assigned to specific functions to enhance the reality factor of the developing master planning strategy.

Relative position towards neighbor

At the request of the participating engineer, to enhance a realistic feeling for constructability another factor is assigned to the voxels, related to their relative position towards their neighbors. The rule that was inserted was that each voxel would look to its immediate neighbors. Having fewer neighbors would lead to higher costs, being surrounded at all sides by neighbors would result in the most cost-effective voxel. Also that voxel would be less desirable since it has little or no view to the outside, and therefore, only suitable for specific more indoor functions. Secondly, a structural analysis of the configuration provided feedback for the engineer. The consequences of the configuration is made visible by the visualized tension and compression through the initial shape. Based on the amount of tension and compression in the voxels the building costs estimation of the voxels are adjusted, high compression or tension voxels results in higher building costs. However, the voxels with less tension and compression are estimated to be less expensive to build.

Multimodality

The multimodality of use of the spaces and the nature of the unfolded activity is related to their revenue, again based on experience from the practice of the stakeholder cq the project developer. Retail brings in more revenue than habitats per m2 per period of time. The position of the shop in de 3d swarms of voxels determines the details of the lease contract.

Ubiquitous booking app

The system that underpins the flexibility in use in time and space of the voxels is based on a ubiquitous booking app, yet to be developed by the authors. Via this app the customer choses place and time space of the lease. The unique aspect of the ubiquitous booking app is that one can book homes, office space, retails space for any

period of time, ranging from ultrashort to ultralong, and get immediate feedback from the system, including the contract. Not different from booking a flight, a hotel or a car, but now for a space to live in, to work or to spend quality leisure time.

Added value for green spaces

As introduced by the social engineer, a bonus factor for green spaces adjacent to one's voxel is introduced in the parametric model. The immediate presence of a green space leads to a higher value of the voxel, they can be leased, either for shorter or longer periods of time, for a higher price. Especially the project developer validated this enhancement a lot, since it is often soft values that make up the potential profit in any project. The Participator design instrument supports the above features in real time.

Not in the model

Intentionally not included in the model are elevators, stairs, fire safety measures, windows etc, as to keep the urban design tool strictly urban in its nature. They simply are taken into account as a percentage of the total volume and costs. The outcome of the Participator urban design game is the starting point for further development into an architectural model. In such further levels of detail, the integrity of the model and its intimate relations to the data must be maintained. When the urban model and the architectural model are developed as a further specification, always referring to its origin as member of the point cloud of reference points, any change in the chosen parameters in the very beginning of the project, like the chosen selection of reference points, must lead to an immediate change in the architectural model as well. When dynamically connected from concept design to design development, it is expected that an effectivity bonus of an allegedly 20% cost reduction in the design phase alone can be achieved with respect to traditional development of master planning and architectural models. Further cost reduction will be achieved when maintaining the integrity of the data in the subsequent phases to tender, contracting, execution and maintenance.

Conclusion

The thus realized goals and objectives are to have a working participatory urban design tool, designed to generate unexpected spatial and social configurations of clusters of functional voxels. The tool bypasses traditional biased prejudices of what is feasible, in terms of spatial arrangement, constructability and community building. No longer would urban designers want to limit themselves to a simple arrangement of earthbound solid blocks, arbitrarily fixing their height and function. The multimodal urban design instrument favors diversity in spatial arrangements, functional mix and in the social fabric. The participatory multi-player instrument effortlessly weaves diversity into a delicate 3d urban tissue, while securing precise data and outcome along the way of playing the serious design game. At all times the 3d geometry, the spatial definition and the social positioning must stay connected to the data, thus giving reliable and transparent feedback to the stakeholders.

Additional remark

In the current situation with social distancing and working from home, the New Citizen Building Method is easily transformed into a completely virtual multi-stakeholder game without losing its unique qualities and assets.

The New Citizen

The new citizen[*] is the personification of a design movement that is based at its core on positive, human energy, coupled with a conscious relationship to social issues, big and small. The new citizen is a persona, a fictional person who feels lifelike, but who can assume all kinds of socio-demographic guises. In essence, new citizens are inter-viduals: focused on themselves ànd in connection with others.

The new citizen we identify moves in inner cities, is internationally oriented, does not belong to a specific social class or generation and is open to other forms of (co-)living, reflected in mixed living areas and socio-economic models of ownership. They distinguish themselves from other (urban) people by their high degree of self-confidence and through their faith in the people around them, and in the future. They are open to novelty and stand out for their adaptability. It is therefore not surprising that they often lead the way in transformation (small and large) or belong to the direct followers. New citizens have a different lifestyle; based on the idea that things last while they last. They don't make a set plan for their lives but take it as it comes, which makes them agile. They like to contribute to a more beautiful world – the bigger picture as well as in their immediate vicinity. Well-being to them is more important than wealth. They show involvement in personal as well as professional matters beyond their individual stake. Driven by their appealing humanity, they turn original ego-systems into eco-systems. New citizens need impulses and space, the latter mainly metaphorically. Impulses they seek in work, leisure time, in the encounter and connection with their fellow citizens, and from the interior and exterior spaces they dwell in.
They are fluid between their different roles in life (living, working, leisure).

New citizens surround themselves with products and services that reflect their values and lifestyle and seek urban environments with befitting design, planning, programming and socio-economic concepts. Sustainability, circularity, interaction, inclusion and sharing are self-evident for the new citizen.

Figure 6 | New Citizen Design | The new citizen: typology, design and building (illustration rather than exhaustive list)

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[*] Persona created on the basis of international research sources on topics like 'generation, motivation, city planning, trends & innovations, sociocultural developments, future/smart cities & urbanism, attitudes towards transformations & crises'.