Gemeente Amsterdam

Roadmap Circular Land Tendering

An introduction to circular building projects

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Introduction

Amsterdam is a pioneer in the transition to the circular economy. The city has demonstrated its ambitious goals in this domain in both the Sustainable Amsterdam Agenda [Agenda Duurzaam Amsterdam] and the recently signed National Raw Materials Agreement [Nationale Grondstoffenakkoord], particularly with regard to circular building.

Buildings and roads account for an estimated 60% of the total global use of materials. In the Netherlands, the built environment is responsible for 25% of CO_2 emissions and 40% of energy consumption. Making the urban development process and the building chain more sustainable will significantly reduce our impact on the planet, both now and in the future.

In 2016, a study to assess the opportunities for creating a circular economy in the Amsterdam Metropolitan Region showed that making the transition to a circular economy will have a positive economic impact, create new business activity, and make a direct contribution to making the community more livable and sustainable. The report highlighted the potential gains to be made in the building sector in particular. In response to the study, Amsterdam has raised its ambitions with regards to a circular construction value chain even further, next to focussing on the valorization of organic waste flows.

After consulting residents, research institutes and the business sector on the findings of the study, the city launched two complementary programmes. The Circular Innovation Programme 2016-2018 [Circulair Innovatieprogramma] encompasses a series of circular projects in which the city is collaborating with businesses and research institutes. Circular Amsterdam [Amsterdam Circulair] is a programme based on the principle of 'learning by doing', which embraces 23 municipal projects designed to promote the transition to a circular economy. For Project 5 in the latter programme, entitled 'Circular land tendering and projects relating to transformation, demolition and operations' [Circulair tender gronduitgifte en projecten op gebied van transformatieve, sloop and werkgebied], the city asked Metabolic and SGS Search to draft a Roadmap for Circular Land Tendering, with guidance on steps that can be taken to stimulate, measure and reward circular building practices and innovation. With this Roadmap, Amsterdam is the first city in the world to develop an instrument for embedding the principles of circular construction in a tender procedure. The Roadmap will initially be used for tenders for land allocation, primarily for new-build projects, but the ultimate aim is to use the Roadmap also for transformation, renovation and demolition projects.

The Roadmap contains an extensive analysis of what circular building actually is and describes methods for measuring the extent to which construction projects meet the quantitative and qualitative criteria of circular building. It then provides a practical guide to the process of drafting a circular tender. The Roadmap enumerates 32 performance-related criteria that could be used to promote adherence to circular principles in the urban development process, before setting out a four-step process by which the criteria in the tender for a particular project can be selected from that list, depending on factors such as the characteristics of the area where the project is planned, the ambitions for the project and the policy choices that are made. The aim is to draft a tender that leaves market actors with sufficient scope to innovate and produce their own solutions. The Roadmap follows the template of criteria in existing instruments such as BREEAM.

The Roadmap has been written in consultation with market actors and external experts. It will be evaluated later on the basis of the practical experience gained with at least three tenders, as well as insights acquired from transformation, renovation and demolition projects, again with input from the market and experts. This method reflects the underlying principle of Amsterdam's circular economy programme – 'learning by doing'. The evaluation will also give rise to recommendations on whether circular tendering should be incorporated in the city's public procurement policy and, if so, how far it should go.

Guide for readers

This document begins with a brief overview of the features of the circular economy and how the objectives can be translated into criteria for circular building (chapters 1 and 2). These chapters will be of particular interest to anyone wishing to learn more about the principles of the circular economy and circular building. Readers who have no need of this information can proceed directly to chapter 3, which contains a list of the criteria for circular tendering. However, we would recommend that everyone carefully reads at least the seven performance-related characteristics of the circular economy on page 9.

We then come to the core of the report: a list of all the criteria that could be used in drafting a circular tender and a guide to the selection of criteria and the application of the framework in tender procedures for specific plots. The 32 criteria for circular building are enumerated in Chapter 3. Chapter 4 describes how to make a selection from the full list of possible criteria in drafting a specific tender, and the procedure for designing a request for tender. Chapter 5 provides suggestions for the next steps that could to be taken.

The complete list of criteria, including the text that could be included in the tender, can be found in appendix A. The other appendices contain:

- an overview of the data required to assign scores to criteria (appendix B1).
- a model text for a tender, including the way in which information relating to the criteria should appear in the tender (appendix B2).
- a diagram showing the relationships between the criteria for circular building and the criteria in instruments such as BREEAM and GPR Building (appendix B3).
- an elaboration of the four principles of circular building for the selected themes (appendix B4).

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01 The circular economy

The circular economy

The concept of the circular economy has attracted a great deal of interest from governments and business in the last few years. With the popularity and growing use of the concept, there has been a corresponding increase in the number of definitions of the term. Although a certain consensus is being formed among professionals in the discipline, there is no single body with undisputed authority to define precisely what the circular economy is. It is therefore necessary to clarify what 'circular' means in practice.

Various actors in the field (public authorities, companies, etc.) define the circular economy in terms of the types of activity and specific concepts associated with it, for example the use of new business models such as leasing ('product as service'), collaboration across supply chains, using waste as a resource, etc. However, these aspects tell us nothing about what the circular economy actually is, because they describe the means rather than the ends: what the world will actually look like when it is 'circular'.

Without answering this fundamental question, there is a lack of a common understanding of what needs to be achieved, and in turn makes it difficult to measure progress towards a goal. For example, what will produce a more circular result: investing in more expensive renewable materials or in the up-front costs needed to set up a product leasing scheme? If we take the activity-based definitions of a circular economy, we do not gain much insight into the choices we should make. Choosing for renewable materials does not necessarily result in less environmental impact. The same applies for adopting a leasing construction. We therefore need tools that help us to identify what will actually help to make the world more circular in quantitative terms. Objectively verifiable criteria for determining the circularity of a building, company, country or material. We therefore start by considering the process of drafting performance-related characteristics for the circular economy, which can then be used as the basis for criteria for evaluating the circularity of building projects.

Defining the circular economy

There is a heavy focus in the field of the circular economy on the management of materials and ensuring that resource cycles are closed, in a manner similar to what happens in natural systems (in the context of an ecosystem, water, waste and nutrients are continuously cycled among different uses). In defining the circular economy, we can extend this principle to its ultimate conclusion: in a circular economy all materials should be used in such a way that they can be cycled indefinitely (just as they theoretically can in nature).

But that is not the whole story: this definition produces an additional piece of complexity: we don't just want these materials to be recoverable in theory – it has to happen on a time-scale that's relevant to people (so if we create waste that needs thousands of years for recovery, as is potentially the case with nuclear waste, that is not really addressing our original goals for humans and the environment). In addition to this time-scale issue, there is another important recurring principle in discussions of the circular economy and that concerns the preservation of value and complexity: we want to ensure that materials can be cycled at the highest value possible, preferably as components, and not always 'downcycled' back to basic raw materials (which is extremely costly in terms of energy).

Thinking of how materials should ideally be handled in circular economy leads to a further conclusions regarding material toxicity, the scarcity of some materials, the persistence of certain materials in the environment, and many other parameters. On that basis, Metabolic has developed a set of circularity factors that provide guidelines for the optimal use of materials for various functions. These are metrics that can be used to define a material on the basis of its properties such as recyclability, scarcity, toxicity, etc. Using these factors, Metabolic has also developed short-hand recommendations and principles for how certain materials should be used in order to uphold the objectives for a circular economy (see the figure alongside).

Beyond materials

Naturally, in carrying out this exercise we realised immediately that as goals are forumlated for how materials should be managed, many related issues are also encountered. Materials are just one type of resource in our economy, where all flows are ultimately connected and influence one another. In a world with infinite and free energy, it is very easy to design a system that will fully recover materials by means of extremely costly and energy-intensive recycling processes (as we currently see with the recovery of metals from electronic waste, for example).

However, because energy is also a constraint in our current system and is often accompanied by a high levels of environmental impact, we also need to treat it as a scarce resource that should ideally be conserved. In a circular economy, all energy should ultimately be supplied from renewable or other sustainable sources. To achieve this, the efficiency of our energy use also needs to increase significantly. Although we know that the total amount of energy available on the plant is not a constraint (the sun produces more than enough for our needs), collecting that energy in a usable form does require the use of scarce materials, which is in itself a constraint.

The deeper we explore all the implications of striving for a fully closed, circular material cycle, we ultimately find many other connections throughout the economic system that need to be addressed in a way that preserves broader human ideals. This exercise ultimately resulted in a set of seven characteristics that describe the end state of the circular economy once it has been actually achieved. They are presented in the following figure, Seven characteristics of a circular economy. These are idealized features that may never be possible to achieve, but they represent a set of specific targets that we can aim for. They serve as a basis for developing criteria for circular building throughout this Roadmap.

Seven characteristics of a circular economy

(Gladek et al., 2013, 2017)

01 Materials are incorporated into the economy in such a way that they can be cycled at continuous high value and are never dissipated into the environment in unrecoverable form or a form unusable in natural systems.

02 All energy is based on renewable sources.

03 Biodiversity is structurally supported and enhanced through all human activities in a circular economy.

04 Human society and culture are preserved through economic activities.

05 The health and well-being of humans and other species should be structurally supported through the activities of the economy.

06 Human activities should generate value in measures beyond just financial.

07 The economic system should be inherently adaptable and resilient.

Materials are incorporated into the economy in such a way that they can be cycled at continuous high value and are never dissipated into the environment in unrecoverable form or a form unusable in natural systems. A priority is placed on preserving material complexity (the "power of the inner circle"), by cascading materials in their most complex form for as long as possible (e.g., as products rather than components, and as components rather than materials). Material cycles should be designed to be of lengths that are relevant on a human time scale and appropriate to the natural cycles to which they're connected. The length of materials cycles is matched to material scarcity: scarce materials are preferentially cycled at shorter intervals so they can be recovered sooner for reuse. Material cycles are designed to be as geographically short as possible, which varies depending on the ubiquity of the material. In other words, this means that if a material is very commonly available (for example, if you're in a part of the world where there's a lot of rainfall, then water is quite ubiquitously available), then less priority should be placed on transporting that material over a longer distance and it should be handled locally. Density of material consumption should optimally be matched to the density of material occurrence. Materials can be recovered in energetic form when the energetic cost of transporting and processing them is higher than the embodied value of the material itself (this will generally not apply to scarce, non-renewable materials). However, the system is designed to avoid the recovery of materials as energy. Materials should not be mixed in ways that they can no longer be separated and purely recovered, unless they can continue to cycle infinitely at high value in their mixed form (and even then, this is preferentially not done because it limits choice). Materials should be used only when necessary: there is an inherent preference for dematerialization of products and services.

All energy is based on renewable sources. The materials required for energy generation and storage technologies are designed for recovery into the system. Energy is intelligently preserved (waste is avoided), and cascaded when lower values of energy are available for use (e.g., heat cascading). Density of energy consumption should ideally be matched to density of local energy availability to avoid structural energetic losses in transport. Conversion between energy types should be avoided. Avoid transport of energy. The system should be designed for maximum energy efficiency without compromising performance and service output of the system.

Biodiversity is structurally supported and enhanced through all human activities in a circular economy. As one of the core principles of acting within a circular economy is to preserve complexity, the value of preserving biodiversity is one of the highest values within the circular economy. Habitats, especially rare habitats, should not be encroached upon or structurally damaged through human activities. Preservation of ecological diversity is one of the core sources of resilience for the biosphere. Material and energetic losses are tolerated for the sake of preservation of biodiversity; it is a much higher priority.

Human society and culture are preserved through economic activities. As another form of complexity and diversity (and therefore resilience), human culture is important to maintain. Activities that structurally undermine the well-being or existence of unique human cultures should be avoided at high cost.

The health and well-being of humans and other species should be structurally supported through the activities of the economy. Toxic and hazardous substances should ultimately be eliminated, and in the transition phases towards this economy, minimized and kept in highly controlled cycles. Economic activities should never threaten human health or well-being in a circular economy. For example, successfully recycling e-waste by having people burn it over open fires is not considered a "circular" activity despite the fact that it results in material recovery.

Human activity should generate value in measures beyond financial. Materials and energy are not currently available in infinite measure, so their use should be intentional and meaningful contribution to the creation of societal value. Forms of value beyond financial include: aesthetic, emotional, ecological, etc. These cannot be brought down to a common measure without making gross approximations or imposing subjective value judgements; they should, therefore, be recognized as value categories in their own right.

The economic system should be inherently adaptable and resilient. The economic system should have the governance systems, incentives, and mechanisms in place that allow it to respond to systemic shocks and crises. This refers to the distribution of power, the structure of information networks, and ensuring that back-ups exist in the case of failure of parts of the system. The same principles of resilience apply on small as well as large scales.

02 Circular building

Circular building

With the growing demand for materials in the economy and the enormous impact associated with the built environment, the construction sector represents huge opportunities to drive the transition to a circular economy. Buildings and infrastructure account for the largest share of global demand for materials, while more than 50% of all metals consumed, including valuable metals like steel, copper, aluminium and zinc (Beers et al., 2007), are used in buildings. Buildings are currently designed in a way that makes it difficult to recover metals and other materials for high-value use at the end of the building's functional lifespan. Most demolition waste cannot be immediately reused for practical purposes because the materials are damaged or contaminated, or because there are uncertainties about the functional properties of secondary building materials and elements. The majority of building and demolition waste is therefore ultimately downcycled, although that could be largely avoided if building elements were properly labelled and designed to be disassembled without being damaged. The building industry could therefore be a crucial linchpin in the material cycle.

While the construction of buildings and infrastructure causes short-term negative impacts through the use of resources and changes in land use, the design of the built environment can also lock in negative patterns of environmental impact that can last for decades. A building whose design is not energy efficient will – in the absence of expensive renovations – contribute to excessive energy consumption and greenhouse-gas emissions throughout its functional lifespan. The residents of buildings located far from amenities and public transport will have to use the car to get to work or to the shops; the volume of traffic this causes can have an enormous impact. To give one example from Amsterdam: commuter traffic is responsible for roughly a third of the energy consumption during the lifespan of buildings in the Amsterdam-Noord district (Gladek et al., 2015). These are the types of long-term behavioural patterns that can be influenced through the design of the built environment.

The built environment as a leverage point for a circular economy

The design of our built environment is therefore a potentially strong leverage point for creating a circular economy. As a first step towards making that transition, we have formulated criteria that the City of Amsterdam can use in its tendering procedure to assess the extent to which buildings and the construction process comply with the principles of circular building.

The criteria cover five themes: materials, adaptivity and resilience, water, energy, and ecosystems and biodiversity. The choice of themes is pragmatic: it was simply not possible to translate all seven characteristics of a circular economy as described above into assessment criteria for circular building within the scope of this research project.

However, with the chosen themes it is possible to make an integrated assessment of the most important physical streams and so ensure that problem shifts in terms of ecological impact and the physical design of a building can be fully addressed. The themes also cover a wide range of the aspects in existing assessment frameworks, such as BREEAM and GPR Building (see appendix B3), as well as the city's policy objectives for the circular economy and sustainability, which still focus at present on energy and physical material streams (see The City's Ambitions [De Ambities van de Stad], page 4). However, we expect the two other themes, Health and Well-being and Multiple Value Creation, to become increasingly relevant, particularly in light of the growing popularity of frameworks such as WELL (International Well Building Institute, 2017), and the intention is to incorporate them into our model in the future.

For each of the themes, circular ambitions can be formulated on the basis of four principles. These principles, which are explained in more detail below, describe the sequence in which circular interventions should be taken in order to have the greatest effect, and therefore constitute a tool for creating a comprehensive and coherent assessment framework for the five themes. The four principles in the decision-making hierarchy are: striving to reduce demand for materials, energy and land; synergising, exchanging and cascading of residual streams; sustainable production and procurement; and smart management (see text box: Four Principles of Circular Building).

Four principles of circular building:
reduction, synergy, production and procurement, management

1. Reduce
The easiest way to reduce the impact of extracting raw materials and subsequent production is to reduce the initial demand for such materials. For example, it is important to devise a system based on low demand for energy and materials. It is important to note, however, that the aim should never be to reduce demand for raw materials to such an extent that it becomes a threat to human comfort or the quality of life.

2. Synergize
As soon as the demand for raw materials and the related effects have been minimized, the potential for local sharing of residual streams can be explored. For example, if residual heat is produced in a building, it should ideally be captured and reused in situ. It is particularly important to take locally available resources (such as rainwater or heat from local water sources) and raw materials which one knows will be released during the demolition of nearby building into account in this design phase.

3. Supply
When the synergy effects are exhausted, the remaining functional demand can be supplied by using clean, renewable or otherwise ecologically beneficial sources. Locally produced resources are preferred, because their impact will generally be smaller and their efficiency higher because they do not have to be transported over long distances and major investments in infrastructure are not required. However, the impact and efficiency should be decisive in choosing for local sourcing.

4. Manage
It is important to receive feedback on how the system works to ensure it functions optimally. This involves the creation of transparent data and an information network to so that an efficient and properly functioning system can be established. This form of feedback facilitates changes in behaviour and technological adjustments.

Objectives for circular building
On the basis of these four principles, specific objectives have been formulated for each of the themes in circular building: materials, adaptivity and resilience, water, energy, and ecosystems and biodiversity. Those objectives are described in Appendix B4. They guarantee that a building project complies with our definition of the circular economy. They also ensure that the complexity of a project remains manageable and that pitfalls can be avoided in implementing the principles in practice, as explained in the following text box, 'The pitfalls of circular building'. The stated objectives formed the basis for drafting the criteria for circular building in each of the selected themes, which are described in chapter 3.

The pitfalls of circular building

Although the basic theory of the circular economy sounds simple enough, in practice, one encounters many complexities and trade-offs when translating circular economy principles into concrete applications. For example, although it may initially appear that from a circular economy perspective we should strive to use recycled materials whenever possible, this approach is not always advisable in practice and can lead to undesirable outcomes.

In many cases, materials are "downcycled" for use in new applications, where they are used in a lower-quality form then they are actually suitable for. One such case is the use of old textiles in wall insulation products. This is not the most effective use of textiles, because they have a higher value for other applications. Textiles are also not a particularly effective insulation material when compared with other available options. Furthermore, insulation based on "downcycled" textiles, which is often made of a mix of waste textiles and plastic binders, is almost impossible to recycle when it has reached its own end-of-life. This creates a "dead-end" in the material cycle, which is precisely what we need to avoid in the transition to a circular economy.

The direct reuse of recycled materials in buildings also causes other complications. The functional and structural properties of building materials can degrade over time in an irregular and unpredictable fashion. Steel beams recovered from the same building will not necessarily all have the same structural properties after 30 years of use. To guarantee that they are safe for reuse, every one of them has to be tested, which can generate substantialy higher costs than using virgin materials. Even without these technical complications, there are many difficulties associated with the design of buildings that incorporate elements of varying standards and quality.

The use of reused materials can yield many hidden costs in a building project. It can, for example, extend the duration of design and construction, sometimes lead to greater on-site waste generation, and it generally requires large amounts of potentially expensive storage space for stockpiling and material sorting. However, there are many occasions when the use of recycled materials is strongly recommended for functional, aesthetic and efficiency reasons. It is essential to understand the critical factors that make the use of recycled materials advisable or not in different contexts. By constantly monitoring the four principles in the decision-making hierarchy (reduction, synergy, production and procurement, management), these pitfalls can be avoided.

03 Criteria for circular building

Criteria for circular building

The four principles of circular building mentioned on page 13 and the five selected themes of circular building described in chapter 2 were used as the basis for formulating 32 criteria that can be used to design a circular tender. Those criteria are listed in figure 1 below. The detailed explanations of these criteria and the method of scoring them can be found in appendix A.

Although circularity is a complex concept, the discussion in the preceding chapters allows us to give a definition of circular building.

Circular building can be defined as:
"The design, construction and demolition of a building in such a way that it incorporates not only the high-value use and reuse of materials, and an adaptive and future-proof design, but also ambitions for sustainability in relation to energy, water, biodiversity and ecosystems at the building an area level."

The following criteria are key in assessing plans for the construction of circular housing in Amsterdam.

Materials

Reduce
1. Use of materials during the lifespan
2. Environmental impact of materials used (Environmental Performance of Buildings, MPG indicator score)

Synergize
3. Design for disassembly (DfD)
4. Theoretical reusability of materials or components at an equivalent level of quality
5. Use of secondary materials for the building process
6. Reuse of earth and residual streams during the construction phase

Supply
7. Policy on circular contracting
8. Certification of materials
9. Use and capture of scarce and critical materials
10. Use of renewable materials

Manage
11. Material passport

Apex criteria
12. Total score on circular material use

Adaptivity and resilience

Reduce
1. Reduce dependence on external material and energy streams
2. Climate-resilient building

Synergize
3. Integration in the urban development
4. Flexible, redundant and adaptive design

Manage
5. Information management systems

Water

Reduce
1. Reduction of water demand

Synergize
2. Cascading of water streams: recovery of grey water and rainwater
3. Recovery of resources from wastewater

Manage
4. Existence of water management system: monitoring and feedback
5. Rain-proof design

Energie

Reduce
1. Energy efficiency
2. Embodied energy

Synergize
3. Energy cascading

Supply
4. Renewable energy
5. Energy matching

Manage
6. Performance feedback
7. Energy performance contracting

Ecosystems and biodiversity

Reduce
1. Embodied biodiversity impacts

Synergize
2. Ecosystem services

Produce
3. Enhancement of local biodiversity

Figure 1: Criteria for circular building

Research method and formulation of criteria

Defining the assessment framework for circular building involved the following steps:

1. Translation of the objectives of circular building described in chapter 2 into criteria and the accompanying scoring method (see appendix A)
2. Consultation with market actors and experts to evaluate and refine the criteria and ensure they can be applied in practice.
3. An iterative internal evaluation and refinement of the criteria, including a careful review of what is feasible in terms of the information that can be requested in a tender for land allocation (what data is already available, what guarantees can be given?).

Qualitative and quantitative requests for tender: an example

This example uses the criterion "Materials 4": Theoretical resuability of materials or components at an equivalent level of quality." to illustrate the practical use of quantitative and qualitative criteria.

It will almost always be difficult, if not impossible (or undesirable), to ask applicants, at the start of the tender procedure, to submit plans in such detail that they can demonstrate, with thorough underpinning and specifications, the proportion of the materials and elements used that can be reused at an equivalent level of quality when those elements are later removed during renovation, maintenance and/or demolition.

In that case, for a quantitative assessment the applicants will have to give an indication, with underpinning, of which elements and materials can be removed more or less undamaged from the building for high-value reuse on the basis of or linked to the MPG indicator, together with a comprehensive list of the materials and elements to be used, expressed in kilograms or tonnes per element or material. They will also have to specify the means of attachment or assembly and the estimated functional lifespan of the element/material. The quantity of elements and materials capable of high-value reuse must also be expressed in kilograms or tonnes. This information can only be provided with a highly detailed design, which, as already mentioned, will almost never be the case at the start of the tender procedure. Requiring applicants to provide these details at such an early stage of the process would impose too much of a burden on them.

Accordingly, a qualitative request for tender could or should be used for this indicator, with applicants being asked to submit an action plan or a vision of how they address these aspects. There are various occasions later in the development process when the actual results can or should be measured:

- At the time of the application for an environmental permit, when the design is sufficiently advanced to provide the necessary details and specifications, including the means of attachment or assembly.
- On completion of the building, when the performance of the physical elements can also be measured. That is still within the scope of the developer/builder, and can therefore actually be demonstrated.
- During future renovation, maintenance or demolition. This always fall outside the scope of the developer / builder and therefore cannot be or seldom is measured.

Scoring method

In translating the objectives of circular building into measurable criteria, some outcomes were found to be difficult to measure, for example because they can only be measured at the end of the building's functional lifespan (e.g., the percentage of materials that is actually recycled), the details are not yet known when the provisional design is made (e.g., the precise materials and where they will be sourced are often determined later), or because they will depend on the use of the building (a multifunctional design should lead to multifunctional use over the course of the building's lifespan). Wherever possible, therefore, we have formulated a quantitative and a qualitative version of each of the selected criteria. The quantitative indicators relate directly to the building's environmental performance; the qualitative indicators refer to a process, a commitment, the type of contract, compliance with a design principle, or a course of action.

As far as possible, we have also tried to build on existing scoring methods in defining these criteria. SGS Search submitted criteria used in existing mechanisms for assessing the sustainability of buildings such as BREEAM (the Dutch version of the Environmental Assessment Method for buildings developed by the British Building Research Establishment (BRE)), GPR Bouw (a Dutch software program to assess and rate environmental impact) and FLEX, and Metabolic provided input from previous relevant work done in the field and existing frameworks for developing a circular economy. Appendix B3 gives an overview of the relationships between the criteria in this Roadmap and these other frameworks.

By using the formula below, we can be certain that components of the overall score that would also be achieved without any additional effort, i.e., the minimum score, are not incorrectly rewarded.

(V - MINV) / (MAXV - MINV)

Where:
V = the established value for a specific criterion for the dwelling in question.
MinV the minimum score that has to be attained for a criterion, because it is a statutory requirement, a prevailing market standard, or a natural physical condition.
MaxV the maximum score that can be awarded for a criterion.

Figure 2: Scoring method of criteria for circular building

On the other hand, the maximum score is awarded for what is realistically feasible for a dwelling in the Netherlands, and a project or bid is only 'punished' with a lower score in the assessment if the performance on the particular criterion mails to come up to this realistic standard. If the minimum value is 0, for example for the proportion of renewable energy that is used or generated when there are no prescribed statutory or project-specific requirements, the outcome is calculated as the actual value in proportion to the maximum. A score of 0.5 can be interpreted as the average value between the poorest and best possible performance on the criterion concerned.

Ideally, the maximum and minimum values for the indicators should always be determined on the basis of a review of the literature on topics such as housing elsewhere, the worst and best practices in the market, or the legal requirements for the relevant theme. Unfortunately, minimum and maximum values have often not yet been defined for indicators because there has been relatively little experience with circular building. We have therefore chosen to define how points can be earned and how a maximum score can be attained for each indicator, so that an assessment can still be made even when it is impossible to properly estimate minimum and maximum values (because there are no best practices or because there is no legislation governing a particular criterion, for instance).

Another way of resolving this problem is by awarding a relative score, where the minimum value is the score awarded to the worst-performing applicant and the maximum value is the score of the best-performing applicant on the relevant criterion. We have not chosen that option here, but naturally it is a system that could be used.

Meanwhile, as the criteria are used and scored in practice, public authorities and companies will accumulate and share more information about what is feasible in terms of circular building. In the process, it will become easier to refine the criteria with additional and more detailed information, and thus define the range between minimum and maximum values more precisely. Accordingly, the scoring method should be updated regularly in line with developments in the regulation of the market.

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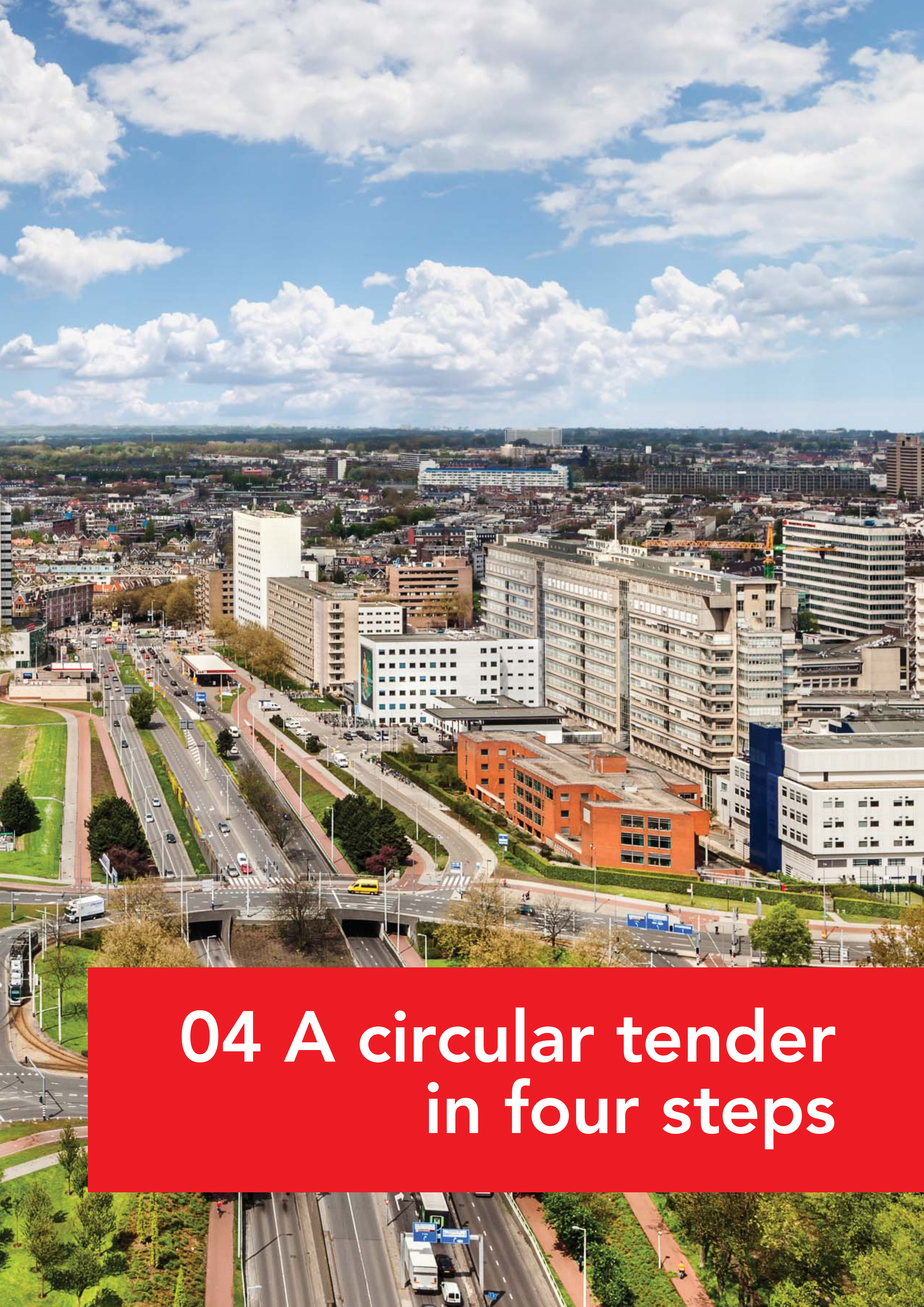

04 A circular tender in four steps

A circular tender in four steps

In this chapter we explain how a circular tender can be designed on the basis of the 'menu' of 32 criteria described in chapter 3. The following steps have to be taken in drafting a circular tender (see also figure 3):

Step 1: Frame the tender in the context of the existing situation, taking into account both the characteristics of the area concerned and the features of the specific plot.

Step 2: Clearly enunciate and develop the ambitions for the plot.

Step 3: Determine the most appropriate tender procedure and the level of detail required in the request for tender.

Step 4: Devise an integrated and systematic method for making a final selection of criteria.

Each of these steps is discussed in this chapter, resulting in a manual for compiling and drafting a circular tender. There are three key objectives in this process (see also figure 4):

- To prioritize the circular objectives for a specific location and area, having regard to the varying roles of the private and public sectors (steps 1 and 2)
- To promote innovation rather than imposing restrictions on market actors; prescribe the ends, rather than the means (step 3)
- To formulate a comprehensive strategy geared to promoting circular building, with the emphasis on materials, and resilience and adaptivity, but without causing problem shifts (step 4)

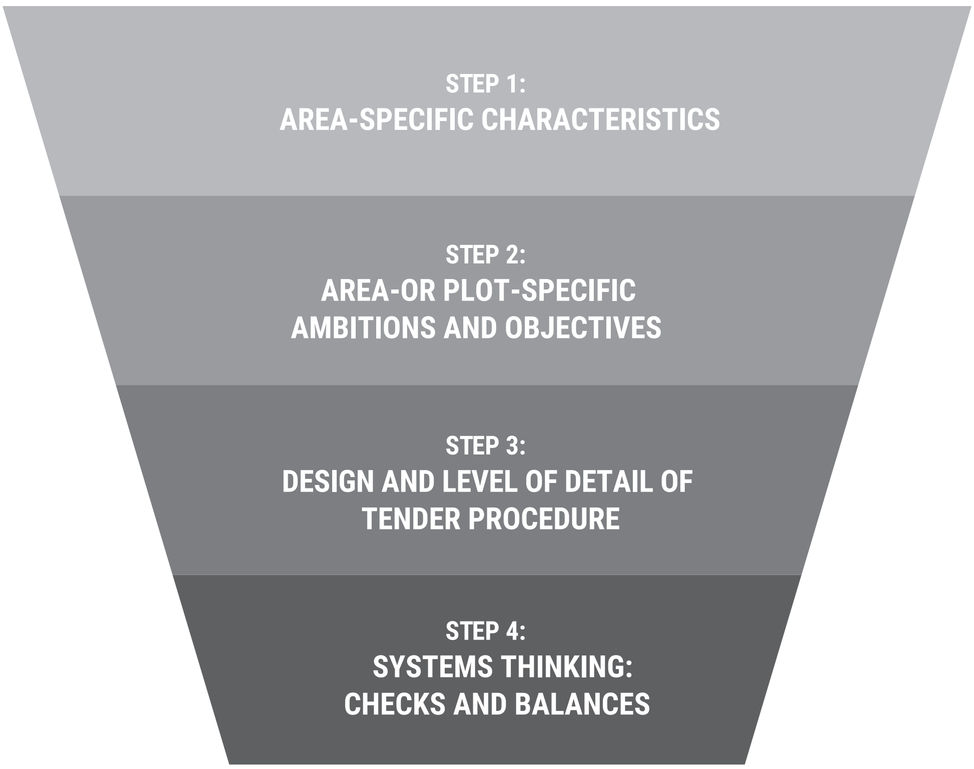

Figure 3: A step-by-step plan for drafting a circular tender

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STEP 1: Framing in the context of the existing situation and spatial plans

Designing the tender for a particular site is part of a far wider process of spatial planning and urban development or regeneration. The principles of circular building and the indicators specified in this Roadmap should preferably already be taken into account in the basic conditions adopted earlier in the planning process (for example, when drafting the development strategy for an area, zoning plans and plans for the urban infrastructure). We will return to this point in the the conclusions and the discussion of next steps to be taken. The basic conditions must be taken into account in the tender documents, and for the purposes of selecting criteria, the most important thing is to apply them smartly.

The first question we have to ask ourselves in drafting a circular tender is:

Does the area possess any particular characteristics (infrastructure, utilities and measures relating to spatial planning, etc.) that could have a positive or negative impact on the basic conditions, the criteria and the assessment system that apply for the plot?

1.1. A selection based on area-specific characteristics and objectives

In Amsterdam, the answer to this question is almost always ‘yes’. In selecting the appropriate criteria for land allocation, the influence of the area’s characteristics must always be considered to ensure that the criteria reflect the local situation and objectives. Here are just a few examples of area characteristics that could have an impact:

- the presence or otherwise of a central energy infrastructure (e.g., a heat network);
- physical geographical properties (soil, proximity to waterways or open water, the elevation of the plot and area concerned);
- the presence of buildings on the plot;
- etc.

We recommend first filtering the menu of 32 criteria to make a smaller initial selection of criteria based on the area-specific characteristics. The question is not whether area-specific characteristics or urban planning frameworks will affect the request for tender, but how. The extent to which a building can be developed and built according to circular principles is already largely determined before the land is issued, particularly in zoning plans, area development strategies and the design and roll-out of urban infrastructure. Although it lies outside the scope of this Roadmap, we strongly recommend that the principles of circular building should be taken into account throughout the urban development and spatial planning process that precedes the issuing of land.

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1.2. Decision tree based on area characteristics

A decision tree is a helpful tool for weighing the impact of area characteristics and features. It makes it easier to arrive at a carefully considered decision by highlighting alternative solutions and possible choices. The decision tree in Figure 5 (page 24) is a model for identifying the criteria that are of particular importance in the context of an area's specific characteristics and a site's features.

The decision tree embraces five area-specific features: infrastructure, demolition, site status, physical geographical features, and price dependence. These are all features that have to be taken into account in selecting the criteria for a circular tender, and the decision tree can be used to refine the selection made on the basis of those features.

Under infrastructure, for example, the first step is to choose the 'status' of a feature: permanent infrastructure may be "present" or not. "Present" means that infrastructure is already in place for the plot and the surrounding area, or there are firm plans to establish it. An example would be plans for the development of infrastructure and green space in the area. If there is already public green space in the area, four criteria are particularly important:

- Water, indicator 5: Rain-proof design;
- Ecosystems and biodiversity, indicator 2: Ecosystem services;
- Ecosystems and biodiversity, indicator 3: Enhancing local biodiversity;
- Adaptivity and resilience, indicator 2: Climate-resilient design.

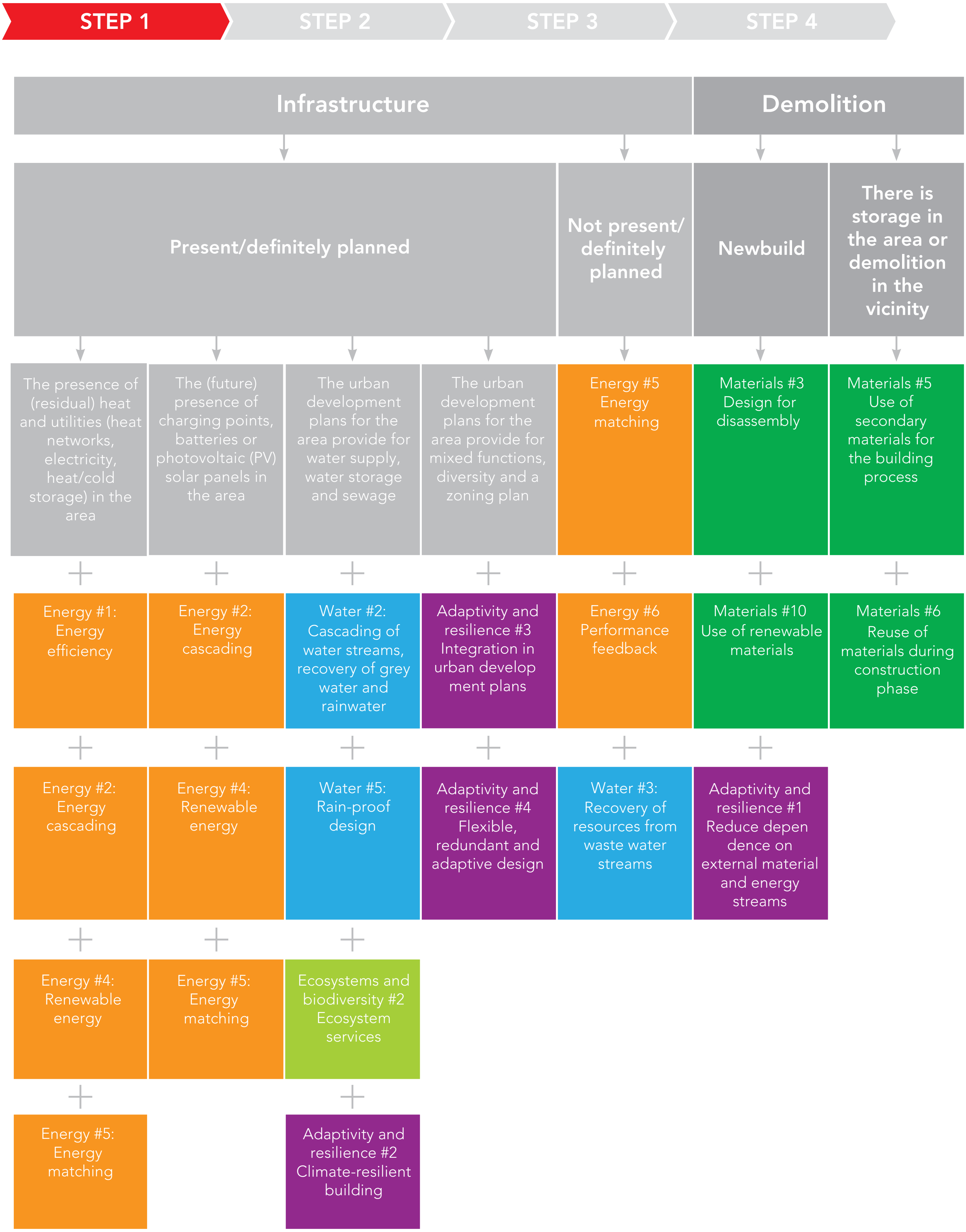
Another example would be the physical geographical properties of an area. If the area in which the plot is located is particularly susceptible to flooding, a rain-proof and climate- and flood-resilient design become more important. Following the decision tree, the result in this case would be a recommendation to include the indicators Water 5: Rain-proof design and Adaptivity and Resilience 2: Climate-resilient design in drafting the tender. If, on the other hand, the area is sensitive to heat, important indicators to include are Ecosystems and biodiversity 2: Ecosystem services and Adaptivity and Resilience 2: Climate-resilient design.

Housing will be built in different ways in different areas, so different objectives and criteria will apply in the process of issuing land. To illustrate how the decision tree can be used to tailor the selection of criteria to an area's specific characteristics and problems, in the example on the following page we have applied it to a specific area of the city: Centrumeiland. The example is based on the information available at the beginning of 2017. Naturally, changes in the building programme and progressive insight could lead to alternative outcomes in the definitive version.

Making an initial selection on the basis of area characteristics is just the first step in drafting a tender. Although the area-specific approach yields a far smaller selection from the original list of 32 criteria, we recommend further refining the categories of criteria and the selection by:

- considering the specific ambitions for the plot and the area;
- considering the type of tender and its level of detail;
- and, finally, systematically reviewing the selected criteria for 'checks and balances' and 'double counting' in the set of criteria.

On the following pages you can see an example decision tree and case study, before continuing onto step 2.


STEP 1
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Infrastructure
Demolition
Present/definitely planned
Not present/ definitely planned
Newbuild
There is storage in the area or demolition in the vicinity
The presence of (residual) heat and utilities (heat networks, electricity, heat/cold storage) in the area
The (future) presence of charging points, batteries or photovoltaic (PV) solar panels in the area
The urban development plans for the area provide for water supply, water storage and sewage
The urban development plans for the area provide for mixed functions, diversity and a zoning plan
Energy #5 Energy matching
Materials #3 Design for disassembly
Materials #5 Use of secondary materials for the building process
Energy #1: Energy efficiency
Energy #2: Energy cascading
Water #2: Cascading of water streams, recovery of grey water and rainwater
Adaptivity and resilience #3 Integration in urban develop ment plans
Energy #6 Performance feedback
Materials #10 Use of renewable materials
Materials #6 Reuse of materials during construction phase
Energy #2: Energy cascading
Energy #4: Renewable energy
Water #5: Rain-proof design
Adaptivity and resilience #4 Flexible, redundant and adaptive design
Water #3: Recovery of resources from waste water streams
Adaptivity and resilience #1 Reduce depen dence on external material and energy streams
Energy #4: Renewable energy
Energy #5: Energy matching
Ecosystems and biodiversity #2 Ecosystem services
Energy #5: Energy matching
Adaptivity and resilience #2 Climate-resilient building

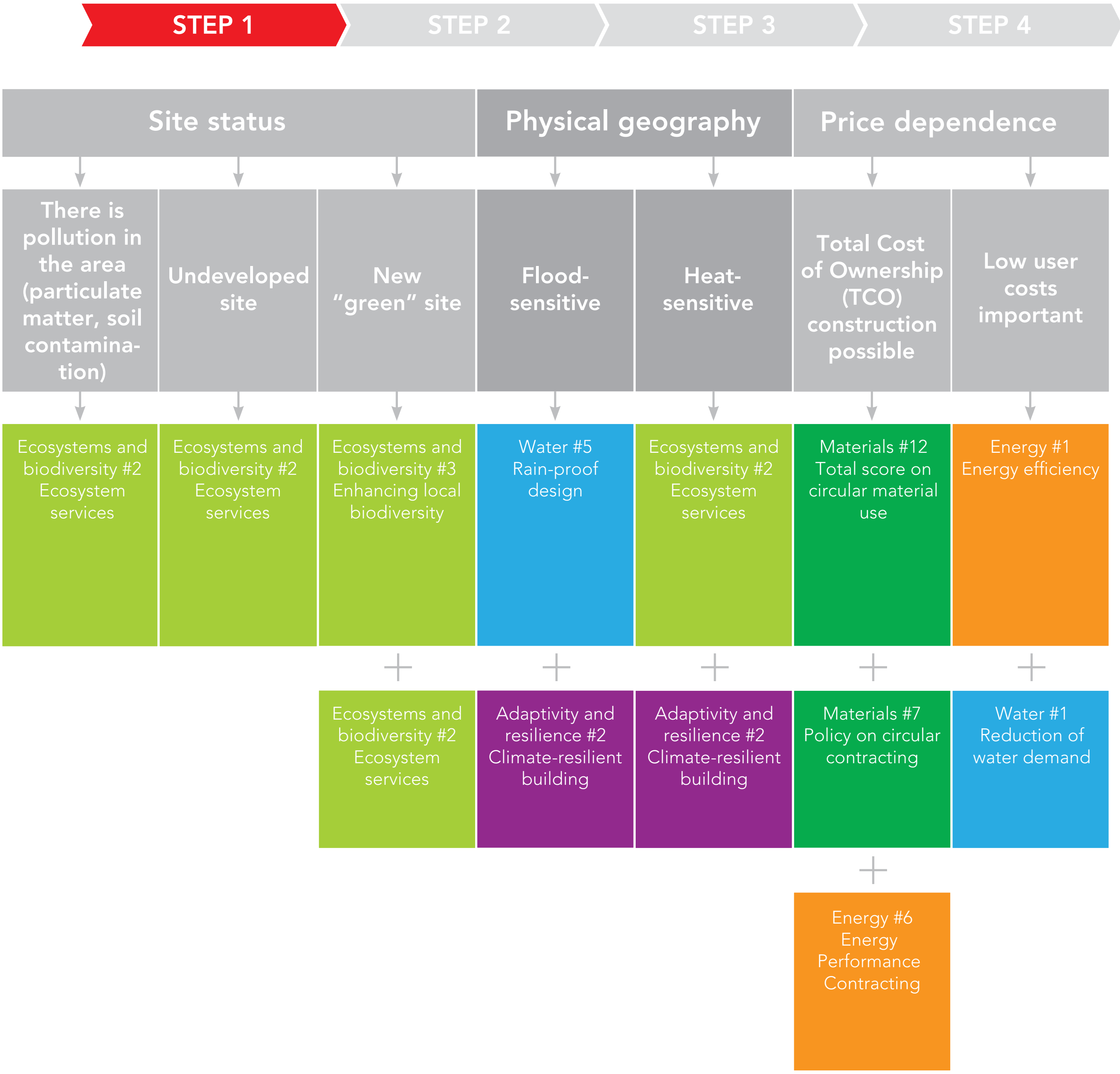

Figure 4: Decision tree: selection criteria for tender on the basis of area characteristics

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A circular tender for plot X on Centrumeiland Amsterdam

Step 1: selection of criteria on the basis of the features of the plot and the area

At the end of 2013, the City of Amsterdam started construction of Centrumeiland, the fourth island in the city district of IJburg. Amsterdam revived the plans after they had stalled for a number of years (City of Amsterdam, 2016). IJburg is a group of six islands to the east of the city, where approximately 18,000 homes are being built to house around 45,000 residents. Centrumeiland is the second phase of the project. It has a capacity of approximately 1,000-1,200 dwellings and the following characteristics are relevant for the selection of criteria (Startvisie Centrumeiland [Launch Strategy for Centrumeiland], 2015):

- There is no existing or planned infrastructure for energy and water in the area; no decision has yet been made on whether the island will have an urban heating system, will run on gas or will be an all-electric island.
- The area has one dominant function, housing. In contrast to the plan in 2003, it will not form the heart of IJburg with a concentration of the non-residential programme (offices and shops).
- The development process is open and flexible, with a lot of self-build and development of individual plots.
- It is a greenfield development: there are no existing functions in the area in question and there will be no demolition of existing buildings.
- The development is on the water. As with all the other islands of IJburg, its location in the IJmeer is Centrumeiland's most important characteristic.

The decision tree shows the objectives (and hence criteria) that we feel should be emphasized for each of the area's characteristics (see figure 4). This leads to the following initial shortlist of criteria on the basis of area characteristics:

- Materials, indicators 3 and 10;
- Energy, indicators 4, 5 and 6;
- Water, indicators 4 and 5;
- Ecosystems, indicators 2 and 3;
- Adaptivity and resilience, indicators 1 and 2.

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STEP 2: Formulating the ambition for the plot

The objectives and ambitions for particular areas of the city and individual plots within them can vary greatly, and will not necessarily correspond with the urban development frameworks and area-specific characteristics that were considered in making the initial selection in step 1. We therefore recommend refining the initial selection made on the basis of the area characteristics by explicitly considering the policy objectives for the specific location and the ambitions of residents and businesses in the area. The central question here is:

> What are the specific ambitions and objectives for the area or plot covered by the tender, and how can they be addressed in the criteria for circular building?

Reviewing the objectives and ambitions for the area in question will often, but not always, reduce the number of criteria to be considered. If, for example, there is a central water and energy infrastructure but politicians or other stakeholders wish to promote decentralisation or self-sufficiency in terms of water and energy supply, it might still be necessary to include criteria on that theme (e.g., Materials, indicator 9; Adaptivity, indicator 1; Water, indicator 2; Energy, indicators 3, 4 and 5; and Ecosystems, indicator 2), although they were not initially selected on the basis of the area-specific characteristics.

However, we recommend thinking carefully before including criteria that do not follow directly from the specific characteristics of the area or plot concerned. Adding criteria is not a problem if the objectives and ambitions supplement the criteria selected on the basis of the area- or plot-specific characteristics, and are not in conflict with them. However, if they are, we recommend modifying the ambitions and aligning them with the characteristics of the area and the planning frameworks.

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A circular tender for plot X on Centrumeiland Amsterdam

Step 2: refinement of selected criteria on the basis of local ambitions for sustainability

The initial selection for Centrumeiland produced ten criteria. However, we can refine that selection by considering the ambitions for the area concerned. The City of Amsterdam has pronounced area-specific ambitions in relation to:

- Self-sufficient and energy-neutral building
- Climate-resilient and rain-proof building
- A healthy city and outdoor space.

Taking these objectives as a guideline, we are left with the following nine criteria:

Self-sufficient and energy-neutral -> Energy, indicators 4, 5 and 6; Water, indicator 3; and Adaptive, indicator 1;
Climate-resilient and rain-proof -> Water, indicator 5; and Adaptive, indicator 2;
Healthy city -> Ecosystems, indicators 2 and 3.

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STEP 3: The tender procedure and the level of detail in the request for tender: translation of the selected criteria

In steps 1 and 2, the ambitions and objectives for the area were translated to the specific plot and an initial selection was made of possible criteria. In the example of Centrumeiland, there were nine criteria. The next step is to determine how these criteria can be incorporated in the request for tender and the tender document. The following aspects are relevant and are discussed in more detail below:

3.1. The choice of tender procedure: is it in one or two stages?;
3.2. The request for tender should be stimulating and not impose an excessive burden on market actors;
3.3. There should be a relationship between the criteria and existing instruments and indicators;
3.4. There should be a procedure for assessing applications during the tender procedure and at later stages of the development.

The central question here is:

> How should the tender procedure be designed to ensure that it provides guidance and generates concrete, quantitative insights about the circular performance of a building s design, while at the same time not imposing such a burden on candidates that it deters them from applying or eliminates the scope for an innovative or creative design?

3.1 Choices in the tender process: one or two stages

The criteria for the Most Economically Advantageous Tender in the request for tender will depend in part on whether the tender procedure is in one or two stages.

If there is just one stage, perhaps with a great many candidates, it is inadvisable to make the request for tender too specific, extensive (with too many criteria and too much detail) and quantifiable. Candidates should instead be asked to provide action plans or more abstract visions of their plans, accompanied by evidence that they will be able to meet specific criteria in terms of quality (including circularity).

This approach can also be chosen for the first stage of a two-stage tender procedure, in which case a smaller number of candidates (three to five) will be selected from the larger initial group and asked to submit more specific and more detailed bids. However, the following reservations apply for this option.

Naturally, the decision on the number of stages in the tender procedure is made by the project team and will differ from case to case. If there is a lot of interest in a plot and the municipality wishes to achieve a number of fairly specific objectives, it is advisable to divide the tender procedure into two stages so that the tender procedure can be managed in greater detail. If the municipality's ambitions for a plot and surrounding area are less rigid and the primary aim is to challenge the market to be innovative, a lot can already be achieved with a single-stage tender, while the administrative burden for applicants will be lighter.

3.2 Request for tender: stimulating, without imposing an excessive burden on market actors

One of the goals of a circular land tender is to encourage businesses to come up with innovative solutions for circular building. The municipality's intention is to challenge and incentivize business, not to impose needless restrictions and prescribe in minute detail what candidates must or must not do. With a smart selection of criteria, the process can be steered to produce the desired performance (i.e., management by goals, not by means).

Another important aspect is to avoid imposing a disproportionate burden on applicants with the request for tender. This affects the decision on whether to organize the tender procedure in one or two stages. Requesting highly detailed and very specific bids from a large number of applicants, in single-stage tenders for example, is certainly inadvisable.

Even in tenders in two stages, where an initial selection is made and there are only a few candidates in the second stage, it is important to avoid creating a substantial administrative burden and disproportionate expense. The number of criteria should also be limited in every case. This is also in the municipality's own interests, as it will otherwise be overburdened by the onerous task of assessing highly detailed tenders.

The criteria in the framework are designed to be as specific, quantifiable, measurable and verifiable as possible, so that they can be assessed and rated as

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objectively as possible during the tender procedure.

However, there a number of points that need to be borne in mind:

- It will sometimes be impossible to request and/or assess quantitative information on the basis of the principle behind the criterion. There will then have to be a qualitative assessment.
- Applicants will sometimes have to provide a lot of fairly detailed information to allow for a proper quantitative assessment and rating of the tender. This might not be compatible with the level of detail usually required in a request for tender, for example because a request for tender does not call for a design, but only a business case and spatial programme.
- Because the market is also being challenged to deliver circular innovations, it will sometimes be better NOT to request specific and measurable information. However, in that case candidates can be given the information provided with the criteria as guidance or to provide inspiration rather than as "hard" criteria that will be used for the purposes of assessment.

Appendix B1 contains a table with a summary of the data that should be requested in order to make the best possible quantitative assessment of the relevant criteria.

3.3 Relationship of the criteria to existing instruments and criteria

The following existing criteria are still frequently used:

- EPC standards
- BREEAM classification
- GPR classification

Some aspects that are covered to at least some extent in these guidelines also appear in the framework of criteria for circular building in this document. Wherever possible, we have tried to build on existing standards. To arrive at the best choices for the request for tender, it is important to understand the relationships between the criteria for circular building and the criteria in the other guidelines. Some of our criteria are the same as the criteria in existing guidelines. For example:

Energy performance (the following assessments are all equal to each other)

• Energy performance	(EPC standards)
• Energy 1, energy efficiency	(Framework of indicators)
• Energy 1.1	(GPR 4.3)
• ENE 1	(BREEAM)

Environmental impact of materials (the following assessments are all equal to each other)

• Environmental performance of a building	(Building Decree, Article 5.9)
• Materials 2, environmental impact	(Framework of Indicators)
• MAT 1	(BREEAM)
• Milieu 2.1 MPG	(GPR 4.3)

This means that as well as the criteria themselves, the method of demonstrating that the criteria are met in our Roadmap is also the same as in those guidelines.

These relationships are explained in more detail in Appendix B1 of the report. With this diagram, a project team or a company that would prefer to use alternative guidelines can find the one they need.

3.4 Assessment of the application during the tender procedure and in later stages of the project

If a "detailed" tender is requested, the bids also have to be assessed in detail. Even if the applicants are asked to demonstrate something (thus relieving the assessment committee and/or jury of experts of the need to verify the details itself), the bid still has to be assessed on its merits. If applicants are asked to provide GPR or BREEAM assessments and certificates, they will be verified by an external assessor, but only at a much later stage. At the time of the tender, an overview with a projection of the GPR or BREEAM score will suffice. It should be noted here that both of these assessment systems only cover circularity to a limited extent, and that an assessment based exclusively on a GPR or BREEAM certificate will therefore not fully address the ambitions for circular land tendering.

If no detailed and/or quantitative information is requested, the assessment committee and/or jury of experts will perform a qualitative assessment of the tenders. While that will automatically be the case for some criteria for circular building, for others the option of a qualitative assessment could be chosen. Hence the decision to include two options for some criteria.

Whenever it is decided to request declarations or "projections" of the quality to be delivered (according to the framework of criteria and/or to the BREEAM or GPR system) in the tender stage, it is very important to require and verify that the "projected" quality is

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actually delivered. This condition must therefore be stated explicitly in the tender document, together with interventions or sanctions for failure to meet the quality requirements.

Even if the quantitative and detailed criteria in the list of criteria and indicators in Appendix A are chosen, special care has to be taken to ensure that any such projections are met. However, because many of these indicators are new and are not derived directly from existing BREEAM or GPR systems, but in fact add a new dimension to them, we recommend that for the time being the municipality should be circumspect about imposing financial of other sanctions if the promised performance or standard has not actually been delivered on completion of the building. The pilot projects with circular land tendering are primarily intended to provide the market with the scope for innovation and to give the municipality a chance to gain experience with circular tenders and to learn from them. We therefore recommend:

- finding the right mix of qualitative and quantitative criteria that leaves room for innovation;
- using quantitative criteria for some indicators in the request for tender in order to gain experience with them, and to highlight the ambitions and objectives that are regarded as particularly important in the tender;
- only requiring guarantees for those quantitative indicators in the request for tender;
- asking applicants, on delivery (or completion of the final design/specifications), to quantify the performance on these indicators, without attaching sanctions to the outcomes. The results can be used to build a database of key figures that can be used to produce quantitative benchmarks for the future.

Summary: from selecting criteria to designing the tender procedure

By following these four steps, and planning them carefully, the circular tender can be designed in a way that leaves room for innovation, while at the same time data and knowledge are accumulated to facilitate more detailed tenders in the near future.

We recommend that a tender in two stage should be used whenever possible (3.1). We also recommend leaving as much room as possible for innovation and experimentation; this might imply opting for a qualitative rather than a quantitative request for tender (3.2). To lighten the burden on companies, an effort could be made to tie in with the relevant aspects of existing frameworks such as GPR Building and BREEAM (3.3). Looking ahead, quantitative and detailed insight into the circular performance of buildings will be extremely valuable, so we recommend that, wherever possible, companies should be asked to provide a limited number of quantitative guarantees, which can be scored and measured according to the quantitative criteria in appendix A, even if the information cannot be requested when the land is being issued. This will generate valuable knowledge and data with which quantitative requests for tender can be drafted in the future.

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Step 4: Drafting an integrated and systematic tender

The preceding steps should produce a smaller selection of criteria than the total of 32 criteria that we started with. The criteria for choosing the form the tender procedure should take were defined in step 3. That leaves one more crucial question for the design of a circular tender, which is not so much concerned with the criteria to be incorporated in the tender, but with guaranteeing the permanent, structural sustainability of the built environment:

> How can the criteria for circular building be selected in an integrated and systematic manner without rewarding one dimensional optimization and without causing problem shifts?

With 32 criteria, the 'menu' described in chapter 3 is very extensive. It is not the intention that they should all be used in the land allocation procedure. But as has been explained at length in chapters 2 and 3, it is crucial not to define and measure circularity exclusively in terms of materials and adaptivity: an integrated approach is essential to prevent innovations in relation to materials and adaptive or demountable buildings from being at the expense of targets for sustainability in terms of energy and climate or having a negative impact on local and global biodiversity. In this fourth and final step, we describe how to design an integrated tender, and the criteria it should include, in order to avoid such problem shifts.

An integrated approach as the basis for circular and sustainable building

To give just one example, if it is necessary to use more materials to achieve, the building's envisaged energy performance that has to be reflected in the selection of criteria, so that the pros and cons of the design can be properly weighed. It is therefore essential to be fully conscious of the relationships between the various criteria for circular building, and aware of when it is necessary to select criteria that serve as mutual 'checks and balances' to ensure that the proposal that is submitted is an integrated plan rather than one that focuses on a single dimension. There are two phenomena that need to be controlled for in that context:

- **Double counting:** criteria that are likely to 'generate double scores' by rewarding the same design or process more than once should be avoided, or at least kept to a minimum;
- **On the other hand, it is advisable to look for 'checks and balances':** when a combination of criteria that more or less counteract one another is used, they could act as checks and balances. For example, improving one aspect of the design or the building process could offset the negative consequences ensuing from other aspects.

The matrix in figure 6 on page 36 provides an overview of the most obvious causal relationships to look out for in the selection of criteria.

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		MATERIALS												ADAPTIVITY	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
MATERIALS	1		1							1		1	3	4	
	2	1				7			8	9	10	2	11	12	
	3				3			4		5		6	7	8	
	4			3				10				11	16		
	5		7						13			14	17		
	6											15			
	7			4	10					16		17	18	19	
	8		8			13				20	5	21	6	22	
	9	2	9	23				16	20			23	22	23	
	10		10						5			24	26		
	11	1	2	6	11	14	15	17	21	23	24		25	26	
	12	3	11	7	16	17		18	6	22	26	25		28	
ADAPTIVITY AND RESILIENCE	1	4	12	8				19	22	23		26	28		
	2														
	3														
	4	1		15										31	
	5			9	12							27	29		
WATER	1														
	2														32
	3													30	
	4														
	5														37
ENERGY	1		2										10	32	
	2	5	13			18				24		27	29	33	
	3													13	
	4		3							7			11	34	
	5		4							8			12	35	
	6														
	7							20							
ECOSYSTEMS AND BIODIVERSITY	1	6	14			19			21	25	9	28	30	36	
	2													31	33
	3														

Figure 5: Checks and Balances: An overview of causal relationships for the selection of criteria

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AND RESILIENCE			WATER					ENERGY							ECOSYSTEMS AND BIODIVERSITY		
3	4	5	1	2	3	4	5	1	2	3	4	5	6	7	1	2	3
	1								5						6		
		9						2	13		3	4			14		
	15	12															
									18						19		
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															21		
									24		7	8			25		
															9		
		27							27						28		
		29						10	29		11	12			30		
	31				30			32	33	13	34	35			36	31	
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	14							40									
								39	19			42			21		
	39								20		42				22		
								40									
								41									
								18	42		21	22					
			15		37		38										42
			16													42	

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Double counting in allocation of score

1	Material use over the lifespan and Environmental impact (MPG) of materials used: By striving for less material use, the total MPG could also be more favourable, and vice versa	12	Environmental impact (MPG) of materials used and Use and capture of scarce and critical materials: By striving for a lower MPG, the use of scarce and critical materials (a component of Reduce dependence on external material and energy streams) could also decline and thus produce a more favourable result, and vice versa
2	Material use over the lifespan and Use and capture of scarce and critical materials: By striving for less material use, the use of scarce and critical materials could also decline and thus produce a more favourable result, and vice versa	13	Environmental impact (MPG) of materials used and Embodied energy: By striving for a lower MPG, the embodied energy (a component of MPG) could also decline and thus produce a more favourable result, and vice versa
3	Material use over the lifespan and Total score for circular material use: By striving for less material use, the use of scarce and critical materials and the total MPG (both are components of the Total score for circular material use) could also be more favourable, and vice versa	14	Environmental impact (MPG) of materials used and embedded biodiversity impact: By striving for a lower MPG, the embodied biodiversity impact (a component of MPG) could also decline and thus produce a more favourable result, and vice versa
4	Material use over the lifespan and Reduce dependence on external material and energy streams: By striving for less material use, the use of scarce and critical materials (a component of Reduce dependence on external material and energy streams) could also decline and thus produce a more favourable result, and vice versa	15	Design for disassembly and Flexible, redundant and adaptive design: By striving for design for disassembly, the flexibility and adaptivity of the design could also increase and thus produce a more favourable result, and vice versa
5	Material use over the lifespan and Embodied energy: By striving for less material use, the total embodied energy could also be more favourable, and vice versa	16	Theoretical reusability of materials or components at an equivalent level of quality and Total score for circular material use: By striving for a more favourable theoretical reusability of materials or components, the Total score for circular material use will also be more favourable (and vice versa), since the theoretical reusability of materials or components is a component of the Total score for circular material use
6	Material use over the lifespan and Embodied biodiversity impact: By striving for less material use, the total embodied biodiversity impact could also be more favourable, and vice versa	17	Use of secondary materials for the building process and Total score for circular material use: By striving for a higher proportion of secondary materials, the Total score for circular material use will also be more favourable (and vice versa), since secondary materials are a component of the Total score for circular material use
7	Environmental impact (MPG) of materials used and Use of secondary materials for the building process: By striving for a lower MPG, the use of secondary materials could also increase and thus produce a more favourable result (and vice versa), since secondary materials generally have a more favourable MPG	18	Use of secondary materials for the building process and Embodied energy (MPG) of materials used: By striving for a high proportion of secondary materials, the embodied energy could also decline (provided the dismantling and transport process is not excessively energy-intensive) and thus produce a more favourable effect, and vice versa
8	Environmental impact (MPG) of materials used and Certification of materials: By striving for a lower MPG, the use of certified materials could also increase and thus produce a more favourable result (and vice versa), since certified materials generally have a more favourable MPG	19	Use of secondary materials for the building process and embodied biodiversity impact: By striving for a high proportion of secondary materials, the embodied biodiversity impact could also decline and thus produce a more favourable result, and vice versa
9	Environmental impact (MPG) of materials used and Certification of materials: By striving for a lower MPG, the use of certified materials could also increase and thus produce a more favourable result (and vice versa), since certified materials generally have a more favourable MPG	20	Policy on circular contracting and Energy Performance Contracting: By striving for circular contracts (on every element, including energy systems), the contracts could also include performance contracts for the energy systems and thus their score could be more favourable, and vice versa
10	Environmental impact (MPG) of materials used and Use and capture of scarce and critical materials: By striving for a lower MPG, the use of scarce and critical materials could also decline and thus produce a more favourable result (and vice versa), since scarce and critical materials generally do not have a favourable MPG	21	Policy on circular contracting and Embodied biodiversity impact: By striving for the use of certified materials, the embodied biodiversity impact could also decline and thus produce a more favourable result (and vice versa), since certified materials generally have a more favourable embodied biodiversity impact
11	Environmental impact (MPG) of materials used and Total score for circular material use: By striving for a more favourable MPG, the Total score for circular material use will also be more favourable (and vice versa), since MPG is a component of the Total score for circular material use	22	Use and capture of scarce and critical materials and Total score for circular material use: By striving for a smaller proportion of scarce and critical materials, the Total score for circular material use will also be more favourable (and vice versa), since reducing the use of scarce and critical materials is a component of the Total score for circular material use

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23	Use and capture of scarce and critical materials and Reduce dependence on external material and energy streams: By striving for a smaller proportion of scarce and critical materials, the dependence on external material and energy streams will also decline and thus produce a more favourable result (and vice versa), since reducing the use of scarce and critical materials is a component of the reduced dependence on external material and energy streams
24	Use and capture of scarce and critical materials and Embodied energy: By striving for a smaller proportion of scarce and critical materials, the embodied energy could also be more favourable (and vice versa), since the embodied energy of scarce and critical materials is generally high
25	Use and capture of scarce and critical materials and Embodied biodiversity impact: By striving for a smaller proportion of scarce and critical materials, the embodied biodiversity impact could also be more favourable (and vice versa), since the embodied biodiversity impact of scarce and critical materials is generally high
26	Use of renewable materials and the Total score for circular material use: By striving for a larger proportion of renewable materials, the Total score for circular material use will also be more favourable (and vice versa), since the use of renewable materials is a component of the Total score for circular material use
27	Material passport and Information management systems: By striving for a material passport (with a focus mainly on the material's properties), many functionalities of a building passport (with a focus mainly on a building's flexibility) will also be available, and vice versa
28	Total score for circular material use and Reduce dependence on external material and energy streams: By striving for a more favourable Total score for circular material use, the dependence on external material streams will also decline and thus produce a more favourable result (and vice versa), since the aim of both criteria is to reduce the proportion of scarce and critical materials
29	Total score for circular material use and Embodied energy: By striving for a more favourable MPG (a component of the Total score for circular material use), the embodied energy (a component of MPG) could also decline, and vice versa 30
30	Total score for circular material use and Embodied biodiversity impact: By striving for a more favourable MPG (a component of the Total score for circular material use), the embodied biodiversity impact (a component of MPG) could also decline, and vice versa
31	Reduce dependence on external material and energy streams and Flexible, redundant and adaptive design: By striving to be independent of external energy streams, the adaptivity in relation to future infrastructures and transition scenarios could also be more favourable, and vice versa
32	Reduce dependence on external material and energy streams and Energy-efficient building, including systems and technologies: By striving for energy independence (a component of Reduce dependence on external material and energy streams), energy efficiency, renewable energy and energy matching will already be considered for achieving this goal and the score on these criteria will also be more favourable, and vice versa
33	Reduce dependence on external material and energy streams and Embodied energy: By striving for a smaller proportion of scarce and critical materials (a component of Reduce dependency on external materials and energy streams), the embodied energy could also be more favourable (and vice versa), since the embodied energy of scarce and critical materials is generally high
34	Reduce dependence on external material and energy streams and Renewable energy: By striving for energy independence (a component of Reduce dependency on external material and energy streams), energy efficiency, renewable energy and energy matching will already be considered for achieving this goal and the score on these criteria will be more favourable, and vice versa
35	Reduce dependence on external material and energy streams and Energy matching: By striving for energy independence (a component of Reduce dependence on external material and energy streams), energy efficiency, renewable energy and energy matching will already be considered for achieving this goal and the score on these criteria will be more favourable, and vice versa
36	Reduce dependence on external material and energy streams and Energy matching: By striving for energy independence (a component of Reduce dependence on external material and energy streams), energy efficiency, renewable energy and energy matching will already be considered for achieving this goal and the score on these criteria will be more favourable, and vice versa
37	Climate-resilient building and Rain-proof design: By striving for climate-resilient building, the rain-proofing (a component of climate-resilient building) will also be more favourable, and vice versa
38	Integration in urban development plan and Flexible, redundant and adaptive design: By striving for better integration in existing and future urban development plans, the flexibility of the building could also increase (and vice versa), since a building's flexibility contributes to its integration in future urban development plans
39	Flexibel, redundant en adaptief ontwerp en Energie matching: Door te sturen op adaptiviteit tegenover toekomstige infrastructuur scenario's (is onderdeel van Inpassing stedenbouwkundig plan) kan de zelfvoorzienendheid betreft energie toenemen waardoor energie matching ook gunstiger uitpakt, en vice versa
40	Energy-efficiency of building, including systems and technology, and Energy cascading: By striving for energy efficiency, the (re)use of residual heat could also increase and thus energy cascading could produce a more favourable result, and vice versa
41	Renewable energy and Energy matching: By striving for sustainable energy generation (provided it is local), there will be a certain match (regardless of further matching measures) between energy supply and demand and the result for this criterion will therefore be more favourable, and vice versa
42	Ecosystem services and Enhancing local biodiversity: By striving for ecosystem services, the local biodiversity could also increase and thus produce a more favourable result, and vice versa

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Double counting with pursuit of corresponding objective

1	Material use over the lifespan requires a form of documentation and evidence that the material passport can provide
2	Environmental impact (MPG) of materials used and Material passport: The MPG requires a form of documentation and evidence that the material passport can provide
3	Design for disassembly and Theoretical reusability of materials or components at equivalent level of quality: Design for disassembly incorporates principles (assembly, joints, etc.) that could enhance and complement the theoretical reusability of components and the quality of the materials after disassembly
4	Design for disassembly and Policy on circular contracting: Design for disassembly implies no circular contracts (such as take-back contracts), but both do increase or safeguard the potential for reuse
5	Design for disassembly and Use and capture of scarce and critical materials: With the application of design for disassembly, critical materials are easier to reuse and the capture time and loss of quality of these materials are potentially lower, so both are geared to reducing the impact of scarce materials
6	Design for disassembly and Material passport: Design for disassembly requires a form of documentation of materials and joints; a material passport could be a likely or possible solution
7	Design for disassembly and Total score for circular material use: Design for disassembly implements principles (assembly, joints, etc.) that enhances the theoretical reusability (a component of the Total score for circular material use). They are therefore complementary
8	Design for disassembly and Total score for circular material use: Design for disassembly implements principles (assembly, joints, etc.) that enhances the theoretical reusability (a component of the Total score for circular material use). They are therefore complementary
9	Design for disassembly and Information management systems: Design for disassembly requires a form of documentation of materials and joints; a material passport linked to BIM (as intended in Information management systems) could be a likely or possible solution
10	Theoretical reusability of materials or components at equivalent level of quality and Policy on circular contracting: A high theoretical reusability implies no circular contracts, but both increase or guarantee the potential for reuse
11	Theoretical reusability of materials or components at equivalent level of quality and Material passport: Demonstrating the theoretical reusability requires a form of documentation that a material passport provides
12	Theoretical reusability of materials or components at equivalent level of quality and Information management systems: Demonstrating the theoretical reusability requires a form of documentation of materials; a material passport linked to BIM (as is intended with Information management systems) could be a likely or possible solution
13	Use of secondary materials for the building process and Certification of materials: Secondary materials have no supply chain from the extraction or production location (where a large part of the impact generally occurs), which could make certification less urgent
14	Use of secondary materials for the building process and Material passport: The use of secondary materials requires a form of documentation and evidence that the material passport can provide
15	Reuse of materials during the construction phase and Material passport: The reuse of materials during the construction phase calls for a form of documentation and evidence that the material passport can provide
16	Policy on circular contracting and Use and capture of scarce and critical materials: The use of circular contracts provides better guarantees of the reuse of critical materials, so both are geared to reducing the impact of scarce materials
17	Policy on circular contracting and Material passport: Data on the quantity and identity of materials from suppliers has to be saved. The material passport is a possible solution
18	Policy on circular contracting and the Total score for circular material use: Theoretical reusability (a component of the Total score for circular material use) will be high in light of the reusability that suppliers will require to conclude circular take-back contracts
19	Policy on circular contracting and Reduce dependence on external material and energy streams: The use of circular contracts provides better guarantees of the reuse of any critical materials (a component of independence from external streams), so both can be geared to reducing the impact of scarce materials
20	Certification of materials and Use and capture of scarce and critical materials: The purpose of both is to reduce the impact of materials, with the greatest urgency for reducing the use of scarce and critical materials or certifying that they are sourced responsibly
21	Certification of materials and Material passport: Data on the certification of materials from suppliers has to be saved; the material passport is a possible solution

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22	Certification of materials and Reduce dependence on external material and energy streams: the purpose of both is to reduce the impact of materials, with the greatest urgency for reducing the use of scarce and critical materials (a component of Reduce dependence on external material and energy streams) or certifying that they are sourced responsibly
23	Use and capture of scarce and critical materials and Material passport: Scarce materials require a form of documentation and evidence that the material passport could provide
24	Use of renewable materials and Material passport: Renewable materials require a form of documentation and evidence that the material passport could provide
25	Material passport and Total score for circular material use: The Total score for circular material use requires a form of documentation and evidence that the material passport could provide
26	Material passport and Reduce dependence on external material and energy streams: Reduce dependence on external material and energy streams requires a form of documentation and evidence that the material passport could provide
27	Material passport and Embodied energy: Embodied energy requires a form of documentation and evidence that the material passport could provide
28	Material passport and Embodied ecosystem impact: Embodied ecosystem impact requires a form of documentation and evidence that the material passport could provide
29	Total score for circular material use and Information management systems: Demonstrating the theoretical reusability requires a form of documentation of materials; a material passport linked to BIM (as intended in Information management systems) could be a likely or possible solution
30	Reduce dependence on external material and energy streams and Recovery of resources from waste water streams: Recovered nutrients could be used for food production; these criteria are complementary in this regard
31	Reduce dependence on external material and energy streams and Ecosystem services: Food production (which is a component of Reduce dependence on external material and energy streams) could also be a means of meeting one of the goals of ecosystem services
32	Climate-resilient building and Cascading water streams: recovery of grey water and rainwater: When a rain storage tank is used for the cascading of rainwater, it can also be used to buffer water in the interests of rain-proofing (a component of Climate-resilient building)
33	Climate-resilient building and Ecosystem services: By striving for climate-resilient building, the use of ecosystem services (such as water buffering and preventing heat stress) could also increase and these goals could therefore be complementary
34	Flexible, redundant and adaptive design and Information management systems: Information about the flexibility and redundancy of a building has to be saved in an information management system (a BIM system, for example)
35	Reduction of water demand and Cascading of water streams: recovery of grey water and rainwater: Low water consumption and cascading are both geared to achieving the objective of reducing demand for water and can be regarded as complementary
36	Cascading water streams: recovery of grey water and rainwater and Rain-proof design: When a rain storage tank is used for cascading rainwater, it can also be used to buffer water in the interests of rain-proofing
37	Recovery of resources from waste water streams and Ecosystem services: When nutrients are recovered from waste water streams, it is important to safeguard local and practical use of these nutrients; ecosystem services and food production is a complementary addition to be considered here
38	Rain-proof design and Ecosystem services: By striving for a rain-proof design, the use of ecosystem services (and specifically water buffering) could be a complementary addition
39	Energy-efficient building, including systems and technologies and Renewable energy: Energy efficiency and renewable energy are both geared to reducing the impact of the energy system during the use phase, and can be regarded as complementary
40	Energy-efficient building, including systems and technologies and Feedback on performance of energy systems: Providing feedback to residents can result in lower energy consumption through increased awareness of the energy performance and so yield further energy efficiency during the use phase; these criteria can therefore be regarded as complementary
41	Energy-efficient building, including systems and technologies, and Energy Performance Contracts: Energy Performance Contracts guarantee energy efficiency during the use phase through constant upgrades; these criteria can therefore be regarded as complementary
42	Embodied energy and Embodied biodiversity impact: Embodied energy and embodied ecosystem impact are both included in the environmental impact (MPG) of materials used and could substitute for it as a criterion

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Checks and balances

1 Material use throughout the lifespan and Flexible, redundant and adaptive design: Striving for minimum material use and a building with sufficient capacity and bearing strength for the benefit of redundant design could conflict in practice; balancing these objectives must be considered

2 Environmental impact (MPG) of materials used and Energy efficiency of building, including systems and technologies: Striving for optimal energy efficiency (through wall insulation and triple glazing, for example) and a low embodied environmental impact of materials used can conflict in practice; balancing these objectives must be considered (the embodied environmental impact of energy-efficiency measures should be in proportion to the energy saved over the lifespan)

3 Environmental impact (MPG) of materials used and Renewable energy: Striving for local energy generation (with PV panels, for example) and a low embodied environmental impact of materials used can conflict in practice; balancing these objectives must be considered (the embodied environmental impact of energy-generation measures should be in proportion to the impact saved over the lifespan)

4 Environmental impact (MPG) of materials used and Energy matching: Striving for optimal matching of energy generation and use (with batteries, for example) and a low embodied environmental impact of materials used can conflict in practice; balancing these objectives must be considered

5 Use of renewable materials and Certification of materials: The production of renewable materials might be accompanied by local environmental impacts because of non-sustainable practices (loss of biodiversity, change of land use); guaranteeing their sustainable origin is important when these materials are used

6 Certification of materials and Total score for circular material use: The production of renewable materials (a component of the Total score for circular material use) might be accompanied by local environmental impacts because of non-sustainable practices (loss of biodiversity, change of land use); guaranteeing their sustainable origin is important when these materials are used

7 Use and capture of scarce and critical materials and Renewable energy: Striving for local energy generation (with PV panels, for example) and minimum demand for scarce and critical materials can conflict in practice; balancing these objectives must be considered

8 Use and capture of scarce and critical materials and Energy matching: Striving for optimal matching of energy generation and use (with batteries, for example) and minimum demand for scarce and critical materials can conflict in practice; balancing these objectives must be considered

9 Use of renewable materials and Embodied biodiversity impact: Striving for maximum use of renewable materials (wood, for example) and minimum embodied ecosystem impact of materials used (including minimum use of land and loss of biodiversity) can conflict in practice; balancing these objectives must be considered

10 Total score for circular material use and Energy efficiency of building, including systems and technologies: Striving for optimal energy efficiency (with wall insulation and triple glazing, for example) and a low embodied environmental impact of materials used (a component of the Total score for circular material use) can conflict in practice; balancing these objectives must be considered (the embodied environmental impact of energy-efficiency measures must be in proportion to the energy savings over the lifespan)

11 Total score for circular material use and Renewable energy: Striving for local energy generation (with PV panels, for example) and a low embodied environmental impact of materials used and minimum demand for scarce and critical materials (both components of the Total score for circular material use) can conflict in practice; balancing these objectives must be considered (the embodied environmental impact of energy-generation measures must be in proportion to the impact saved over the lifespan)

12 Total Score for circular material use and Energy Matching: Striving for optimal matching of energy generation and use (with batteries, for example) and a low embedded environmental impact of materials used and minimum demand for scarce and critical materials (both components of the Total score for circular material use) can conflict in practice; balancing these objectives must be considered

13 Reduce dependence on external material and energy streams and Energy cascading: Striving for minimum dependence on external energy streams and the cascading of energy streams (with residual heat from outside the plot, for example) can conflict in practice; balancing these objectives must be considered

14 Flexible, redundant and adaptive design and Energy cascading: Striving for an adaptive design without undesirable lock-ins in energy infrastructures and the cascading of energy streams (with residual heat from outside the plot, for example) can conflict in practice; balancing these objectives must be considered

15 Reduction of water demand and Ecosystem services: Striving for maximum use of ecosystem services (with planting that requires water, for example) and minimum demand for water can conflict in practice; balancing these objectives must be considered

16 Reduction of water demand and Enhancing local biodiversity: Striving for the enhancement of local biodiversity (with planting that requires water, for example) and minimum demand for water can conflict in practice; balancing these objectives must be considered

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17	Energy-efficiency in building, including systems and technologies, and Embedded energy: Striving for optimal energy efficiency (with wall insulation and triple glazing, for example) and a low embedded energy of materials used can conflict in practice; balancing these objectives must be considered (the embedded energy of energy-efficiency measures must be in proportion to the energy savings over the lifespan)
18	Energy-efficiency in building, including systems and technologies, and Embedded biodiversity impact: Striving for optimal energy efficiency (with wall insulation and triple glazing, for example) and low embedded biodiversity impact of materials used can conflict in practice; balancing these objectives must be considered
19	Embodied energy and Renewable energy: Striving for local energy generation (with PV panels, for example) and a low embodied energy consumption of materials used can conflict in practice; balancing these objectives must be considered (the embodied energy of energy-efficiency measures must be in proportion to the energy savings over the lifespan)
20	Embodied energy and Energy matching: Striving for optimal matching of energy generation and use (with batteries, for example) and a low embodied energy consumption of materials used can conflict in practice; balancing these objectives must be considered
21	Renewable energy and Embodied biodiversity impact: Striving for local energy generation (with PV panels, for example) and a low embodied biodiversity impact of materials used can conflict in practice; balancing these objectives must be considered
22	Energy matching and Embodied biodiversity impact: Striving for optimal matching of energy generation and use (with batteries, for example) and a low embodied biodiversity impact of materials used can conflict in practice; balancing these objectives must be considered

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In this matrix, the criteria for circular tendering in the rows and columns are plotted against each other and double counts and checks and balances are highlighted. The matrix should be used to systematically review the causal relationships between all of the criteria derived from the previous steps by searching for each of the selected criteria in the relevant row and then following the row across to check whether there are any numbered red, orange or green squares in relation to the columns for the other criteria. You can then refer to the relevant number in the legend on the preceding pages for further information about the relevant causal relationship. It is advisable to start by noting the numbers of all the coloured squares in the matrix and then checking these numbers in the legend. The red and orange squares at the junctions of two selected criteria are important, while the green squares are always relevant. The colours represent the type of causal relationship:

- Green: This represents a 'check and balance' where a problem shift is likely;
- Red: This represents a double count, where by focusing on one criterion the score on other criteria could also be influenced in the same way;
- Orange: This represents a double count, where focusing on one criterion is also likely to ensure that the underlying specific goal (reduction of negative impact or value creation) of other criteria can be achieved, without significantly influencing the score for those other criteria.

The approach to potential problem shifts is evident: the checks and balances shown in the matrix (the green squares) can be set off against the previously selected criteria and, as long as both are included in the tender, problem shifts will become apparent in the total score, and can thus be avoided and 'punished' with a low score.

There is often little wrong with the first type of double counting (red squares in the matrix): rather than being a problem, achieving multiple objectives with a single measure is in fact an efficient way of achieving ambitions for sustainability and circularity. For example, a green roof will score well on both climate-resilient building and local biodiversity, which is precisely what makes it an interesting measure (although increasing the supporting strength will perhaps require the use of more non-reusable materials). It is therefore a positive measure and should be rewarded.

However, since our objective with the pilots in the coming year is not merely to try and achieve the optimal performance by buildings on all the criteria, but also to encourage innovation in the market, a set of criteria with too many instances of a single measure being rewarded twice could be counter-productive. In that case, one could simply include a green roof in the design and secure such a high score on a variety of aspects that no further innovation is deemed necessary. To avoid this, we recommend avoiding too many instances of double counting of the 'red' variety.

There is less cause for concern with the second type of double counting, the 'orange' squares, in terms of promoting innovation and experimentation, since in this case a high score on one criterion is unlikely to be automatically accompanied by a high score on another one, but instead the two distinct measures taken in relation to the criterion are intended to achieve similar circular objectives. To give an example, attaining a high score on Materials, criterion 3 (design for disassembly) does not necessarily mean that a high score will also be attained on Materials, criterion 7 (innovations in circular contracting). However, both criteria are intended, in different ways, to produce a similar outcome, namely to guarantee high-quality reuse of the components and materials in the building at the end of the functional lifecycle.

This type of case is no impediment to innovation. A high score in one domain could in fact inspire innovation in other areas, as well as the use of possibly complementary measures to achieve the same objective. In other words, this type of situation drives multiple innovations and creates an opportunity to learn what measures and combinations of measures are most likely to achieve the same (or almost the same) objective. Although instances of double counting in this 'orange' category could drive complementary innovations, they are still intended to achieve a similar objective in terms of circularity. Because the number of criteria ultimately selected from the entire 'menu' could be a constraint if there are various circular objectives, with this 'orange' category of double counting we recommend carefully considering whether the underlying goal is important enough to include both criteria for the relevant plot, or whether it would be better to choose an alternative, unrelated criterion that will achieve another objective.

We therefore recommend avoiding the 'red' category of double counting in the pilot projects as far as possible, and carefully considering the importance of the underlying circular objective with the 'orange' category.

The matrix is a tool for understanding the instances of double counting and the checks and balances, so that a decision can be made on whether to omit or

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retain specific criteria, or to include new ones, in the assessment. Naturally, the number of criteria to be included in the request for tender and the thematic priorities are also factors in this decision, so the instances of double counting and checks and balances are not exclusively decisive. As with the decision tree discussed in step 1, we cannot discuss every specific case here, but present a few examples from the Centrumeiland project to show how the matrix can be used to guarantee an integrated, systematic approach that avoids problem shifts and double counting.

A circular tender for plot X on Centrumeiland:

Step 4: checking for double counting and problem shifts in the selected criteria for circular building

D By taking account of the characteristics of a specific area and plot, formulating an appropriate ambition for the plot, and designing the tender that is practical and provides an incentive for innovation, we arrive at the following nine criteria:

- Reduce dependence on external material and energy streams (Resilience and adaptivity 1)
- Climate-resilient building (Resilience and adaptivity 1)
- Renewable energy (Energy 4)
- Energy matching (Energy 5)
- Feedback on performance of energy systems (Energy 6)
- Recovery of resources from waste water streams (Water 3)
- Rain-proof design (Water 5)
- Ecosystem services (Ecosystems and Biodiversity 2)
- Enhancement of local biodiversity (Ecosystems and Biodiversity 3)

The final, and perhaps most important, step in drafting the tender is intended to ensure that, despite the smaller selection of criteria, the approach is integrated, without problem shifts or excessive emphasis on one particular facet. We will therefore first review the selected criteria for potential problem shifts and determine what 'checks and balances' are needed to prevent them, and then check the selection for potential double counting.

By searching for the green squares for these criteria in the matrix, we find that the following problem shifts could occur:

- Reduce dependency on external material and energy streams (Resilience and adaptivity 1), Ecosystem services (Ecosystems and Biodiversity 2) and Enhancing local biodiversity (Ecosystems and Biodiversity 3): By planting for food production, ecosystem services and local biodiversity, water consumption also increases; this problem shift can be balanced by adding Reduction of water demand (Water 1).

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- Renewable energy (Energy 4) and Energy matching (Energy 5): If renewable energy is generated locally and matched smartly, the necessary generation and installations could cause a higher embodied environmental, ecosystem and energy impact and create demand for scarce materials through the use of solar panels, inverters, batteries, etc.; criteria to balance these effects are Environmental impact (MPG) of materials used (Materials 2) and Capturing scarce and critical materials (Materials 9).

So if we want to check for every potential problem shift, we include the following additional criteria in the tender: Reduction of water demand (Water 1), Environmental impact (MPG) of materials used (Materials 2) and Capturing scarce and critical materials (Materials 9).

We also have to check for double counting, which produces the following scenario:

- Reduce dependence on external material and energy streams (Resilience and adaptivity 1) and Renewable energy (Energy 4) and Energy matching (Energy 5): Energy independence implies that there is already a high score for both renewable energy generation and energy matching, so there is less need to include all these indicators.
- Energy matching (Energy 5) and Feedback on performance of energy systems (Energy 6): These indicators might be complementary; feedback on performance could improve the energy matching by prompting a change of behaviour and could therefore cause double scores by encouraging demand-side management.
- Climate-resilient building (Resilience and adaptivity 1) and Rain-proof design (Water 5): Rain-proof design is a component of climate-resilient design and can be omitted when the latter indicator is included.
- Climate-resilient building (Resilience and adaptivity 1) and Ecosystem services (Ecosystems and Biodiversity 2): Planting for ecosystem services can help to mitigate heat stress, which is a component of climate-resilience. Here too there is a potential for double counting and the omission of one of the criteria can be considered.
- Ecosystem services (Ecosystems and Biodiversity 2) and Enhancing local biodiversity (Ecosystems and Biodiversity 3): Ecosystem services can also enhance biodiversity and produce a higher score on that criterion, but this depends on the precise interventions and their design.

These instances of double counting raise a number of considerations. First, it might be decided to retain one of the criteria Reduce dependency on external materials and energy streams (Resilience and adaptivity 1), Renewable energy (Energy 4) and Energy matching (Energy 5), depending on whether one wishes to strive for generation of renewable energy or total independence, possibly in more domains than just energy. It might then be decided to retain Feedback on performance of energy systems (Energy 6) on the basis of the previous choice, in which case there will be no double counting in relation to renewable energy. Climate-resilient building (Resilience and adaptivity 1) also encompasses scores for Ecosystem services (Ecosystems and Biodiversity 2) and Rain-proof design (Water 5), and it is doubtful whether all three need to be combined to promote the necessary innovation. Finally, there is overlap between Ecosystem services (Ecosystems and Biodiversity 2) and Enhancing local biodiversity (Ecosystems and Biodiversity 3) and it has to be decided whether it has any value.

The survey of double counting and potential problem shifts in this example highlights a number of issues that clearly have to be considered to arrive at a selection of criteria that is balanced and rewards fairly. Depending on the choices to be made, up to three 'checks and balances' can be added and up to five double counts can be removed, so that the final selection can include between four and twelve criteria.

From this selection, a single criterion for circular building can then be formulated, which, as with tenders based on factors such as urban planning quality and design ideas, consists of a small number of aggregated sub-criteria. In that case, those are the four to twelve criteria for circular building selected in the preceding steps, which the tender team will combine smartly into a single criterion for circularity.

05 Next steps

Next steps

The Roadmap and the circular tenders based on it represent an initial step in the direction of circular building. There are four important aspects that need to be addressed if they are to achieve their full potential:

1. Innovation and insight: qualitative incentives now, quantitative insights later.
2. Refine and expand the criteria.
3. Guarantee the circular potential throughout the spatial planning process.
4. Guarantee the circular potential during and after the use phase.

1. Innovation and insight: qualitative incentives now, quantitative insights later

The criteria for circular building in this Roadmap are formulated in such a way that scores can be assigned to them in both qualitative and quantitative terms, if necessary. The intention is to avoid stifling the creativity of the market early on by stipulating too many quantitative requirements. During the initial phase, the preliminary design stage for example, the market can be challenged with qualitative criteria, which can later be translated into specific performance indicators and scores, for example when the plans are being fleshed out in the final design. The results will then be documented in a building passport. Saving the building passports in a database will create a source of knowledge that will soon make it possible to issue an increasingly realistic request for tender at an earlier stage. The transition to circular building can then be made without making excessive demands on businesses or 'smothering' innovation with a detailed request for tender.

2. Expanding and refining the criteria

The city will first invite tenders for housing projects and for one non-residential project. In future, the criteria could be used for offices and business premises and for demolition and renovation projects. The Roadmap could also be tested for its suitability for assessing temporary building, for which there are already criteria (for example, design for disassembly and theoretical reusability of materials and components). These criteria will have to be refined, because in this Roadmap they are based on the design and construction of homes with a lengthy lifespan rather than temporary structures.

The Roadmap could also address themes such as health and well-being and multiple value creation (including inclusivity and social capital) more explicitly, since these are themes that go to the heart of the circular economy. Finally, it is the City of Amsterdam's ambition to use the Roadmap to develop standards that could form the basis for national standards (BREEAM standards, the Environment and Planning Act (Omgevingswet) and other relevant legislation).

Figure 6: The districts in which the City of Amsterdam has conducted three pilot tenders for circular building in 2017-2018 (Kop Zuidas, Buiksloterham, Centrumeiland 14-01)

3. Anchoring the potential for circular building in the entire spatial planning process

Much of a plot's circular potential is determined before the land is issued. The plans for infrastructure, urban amenities, waste processing and energy generation systems, zoning plans and area strategies heavily influence the scope for circularity. At the same time, the potential for circular building can be magnified by linking demolition and new-build projects at urban and regional level. This potential can be realized by creating the basic conditions for circular building in the spatial planning for the area, but also for the city and the region. This would cover aspects such as the planning of infrastructure, zoning plans that can be modified and changes of function during the different phases in the use of a building, or area strategies that encourage the local supply of energy and sanitation services.

4. Guaranteeing the circular potential during and after the use phase

The transition to a circular economy is not just about now, but also about the future. How do you prevent gains made in terms of circularity in tenders being undone by future owners and users? Buildings, particularly the main structure, are used for decades. Ownership of a building changes over time. This creates a “split incentive” in the case of circular building: those who devote more time (and often expense) to producing a circular and demountable design are not always those who profit from a lower energy bill during the use of the building or from a higher residual value of materials when it is dismantled and demolished.
It is not yet clear how this legal and financial issue will be resolved. New types of contract, for example “product as a service” models, might be a solution. Another option that could be explored is for the city, as a neutral party, to guarantee high-value reuse of materials, for example by prescribing the components and materials to be used for each plot in a 'zoning/environmental plan' based on the bids for a tender. The zoning / environmental plan would also constitute the framework for assessing applications to build, or for renovation or demolition, in order to safeguard circularity into the distant future. A more radical solution might be “provisional ownership“, where high-value reuse is made a condition of ownership or acquiring ownership. Market actors could use the building passport for this purpose. Each of these possible solutions raises administrative, legal and financial issues that are beyond the scope of this Roadmap: they are affected by national legislation and regulation in various domains and will create a new category of ' institutional' criteria for circular area development if they are applied. Resolving these issues falls outside the scope of this Roadmap.

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Roadmap Circular Land Tendering

Appendices

A: Detailed criteria for circular building

B1: Overview of data required for calculation of the criteria

B2: Sample text for a circular tender

B3: Relationships between criteria for circular building and existing criteria

B4: Four principles of circular building for selected themes

METABOLIC SGS SEARCH

A: Detailed criteria for circular building

The framework for Circular Land Tendering contains two categories of criteria by which tenders can be assessed: quantitative and qualitative criteria.

The quantitative criteria relate primarily to the performance of the end product, the completed building. The qualitative criteria are designed to measure the impact of the relevant activities and processes during the tender procedure. Many of the criteria refer to the documented plans and intentions for the further development process.

MATERIALS | CIRCULAR INDICATORS	
Theme: Materials **Reduce** **Type of indicator: Product**	**1. Intensity of material use during the lifetime of the building (MI)**
This indicator evaluates how a design scores in terms of the intensity of material use (Material intensity, MI) during the lifespan of the building.	
Relevance in the circular economy	The use of materials (in particular non-renewable materials) that are unnecessary for the building's function should be avoided as far as possible. Only if it is unavoidable, do we go on to consider whether the materials and components have been incorporated smartly in the design, whether the materials are sustainably sourced, and whether they can be reused with the highest possible value.
Calculation or evidence for indicator	The builder or developer must quantify the total quantity of materials it expects to use in constructing the relevant building/buildings according to the final design and express it in relation to the functional lifespan of the building and the number of residential units.
Calculation of score	MI = (M/L*B) / M/m²) (total expected material use in tonnes / (technical lifespan of building * total occupancy rate)) (total expected material use in tonnes / (technical lifespan of building * m²)) Score: MI / benchmark of average material use of dwelling in Amsterdam per m² Lower = >50 Equal = 50 Higher = <50

Data			
Necessary data per metric:	Material passport (total materials in tonnes per type per component) Projected functional lifespan of building as a whole and of individual components Total occupancy rate of the building	**Owner of data:**	Designer

Stage of the life cycle at which indicator can be calculated: **design phase**

Information for Tender Team

Specific objective (to be formulated in request for tender)

Excessive use of materials must be avoided. Before choosing sustainable, circular materials, it must first be established that no more materials are being used than are strictly necessary (from a functional and technical perspective). This is determined by studying the intensity of material use during initial construction and on replacement in relation to the functional and/or technical lifespan of the building as a whole and of some main building elements that will have to be replaced at least once during the building's lifespan.

Description of minimum requirement (ground for exclusion)

Not applicable

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

MATERIALS | CIRCULAR INDICATORS

With the design, the applicant must submit a comprehensive overview (if necessary linked to an Environmental Performance of Buildings calculation (MPG calculation, see Materials 2) of the composition and specifications of the building and the associated quantities, on the basis of which the total volume of materials to be used, expressed in kg/ton, can be be calculated.

Submission this comprehensive overview of materials to be used, expressed in kg/ton — 25 points

The applicant must also submit a life cycle analysis showing that solutions have been investigated to reduce the quantity of materials needed for a number of important building elements (main load-bearing structure, roofs, closed façades, open façades/openings in the façade, interior walls, mechanical equipment, floor finishing, wall finishing and ceiling finishing) during construction and in the event of replacement throughout the building's lifespan (number and volume per component/application). The LCA must make clear the functional lifespan of the building as a whole and of the individual elements. The minimum requirement is to submit this analysis, which also has to explain which options have been chosen, and why. These elements must be included in the comprehensive overview that was requested.

Submission of the analysis — 25 points

The applicant shows that the choices that have been or will be made in the design also based on the above analysis — 25 points

The applicant must make an estimate of the intensity of material use (IM) on the basis of the above data. This calculation must also specify the planned gross floor area (GFA) and occupancy rate of the building.

Quantification of the intensity of material use over the building's entire functional lifespan, expressed in kg/ton per m^2 and per residential unit. Material use for replacement during the building's lifespan to be included. — 25 points

Add benchmark later and make score dependent on outcome in relation to reference value

QUALITATIVE SCORING

The applicant must submit an action plan with an analysis of how materials will be chosen for the main elements of the development during the design process and later in the life cycle. The plan and analysis must focus on investigating the possibilities of limiting the quantity of materials required for these main building elements during construction and in the event of replacement during the entire life cycle of the building (number and volume per component/application). They should also indicate what choices have been or will be made on the basis of the action plan and analysis and what "benefits" they yield in terms of reducing the quantity of materials required.

There will be a qualitative assessment of the action plan. A maximum of 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

The evidence that has to be provided

The applicant must submit an action plan and/or a life cycle analysis showing how it has investigated the possible choices of materials and the impact of the choices made on the quantity of materials to be used (expressed in m^2, m^3 and/or kg/ton) during construction and as a result of replacement and/or maintenance thoughout the building's life cycle for the elements listed below. The analysis should preferably also contain conclusions and arguments for the the choice of the option ultimately included in the design. The relevant building components/ elements are the main load-bearing structure, roofs, closed façades, open façades / openings in façades, interior walls, mechanical equipment, floor finishes, wall finishes and ceiling finishes.

How the information/evidence provided will be tested and assessed on submission of application (during the selection procedure)

The municipality will assess whether the requested action plan and/or analysis has been submitted and complies with the specified requirements/criteria. It will also be determined whether the submitted design corresponds with the conclusions in the analysis for the relevant elements.

Description of how performance will be tested and assessed after the application (later in the process/life cycle)

There may be verification that the MPG calculation was submitted and that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion of the building.

MATERIALS | CIRCULAR INDICATORS

Theme: Materials **Type of indicator: Process**	**2. Environmental impact of procured materials (EIPM)**
This indicator evaluates various aspects of the environmental impact of the materials procured for the building, including emissions of particulate matter and greenhouse gases.	
Relevance in the circular economy	Reducing the total quantity of materials used is not a goal in itself: the ultimate objective is to mitigate the impact caused by the use of materials in respect of climate change, resource depletion, and human and ecological toxicity.
Evidence for indicator	With the design, the builder and developer must submit the associated material passport, in which the data are linked to the impact factors used in existing standards. The developer may also choose to perform its own building-specific impact analysis (Life Cycle Inventory, LCI).
Calculation of indicator	EIPM = type and quantities of materials in building passport x MPG factors or EIPM = type and quantities of materials in building passport x MPG factors in building-specific LCA

MATERIALS | CIRCULAR INDICATORS

With the design, the applicant must submit a comprehensive overview (if necessary linked to an Environmental Performance of Buildings calculation (MPG calculation, see Materials 2) of the composition and specifications of the building and the associated quantities, on the basis of which the total volume of materials to be used, expressed in kg/ton, can be be calculated.

Submission this comprehensive overview of materials to be used, expressed in kg/ton — 25 points

The applicant must also submit a life cycle analysis showing that solutions have been investigated to reduce the quantity of materials needed for a number of important building elements (main load-bearing structure, roofs, closed façades, open façades/openings in the façade, interior walls, mechanical equipment, floor finishing, wall finishing and ceiling finishing) during construction and in the event of replacement throughout the building's lifespan (number and volume per component/application). The LCA must make clear the functional lifespan of the building as a whole and of the individual elements. The minimum requirement is to submit this analysis, which also has to explain which options have been chosen, and why. These elements must be included in the comprehensive overview that was requested.

Submission of the analysis — 25 points

The applicant shows that the choices that have been or will be made in the design also based on the above analysis — 25 points

The applicant must make an estimate of the intensity of material use (IM) on the basis of the above data. This calculation must also specify the planned gross floor area (GFA) and occupancy rate of the building.

Quantification of the intensity of material use over the building's entire functional lifespan, expressed in kg/ton per m^2 and per residential unit. Material use for replacement during the building's lifespan to be included. — 25 points

Add benchmark later and make score dependent on outcome in relation to reference value

QUALITATIVE SCORING

The applicant must submit an action plan with an analysis of how materials will be chosen for the main elements of the development during the design process and later in the life cycle. The plan and analysis must focus on investigating the possibilities of limiting the quantity of materials required for these main building elements during construction and in the event of replacement during the entire life cycle of the building (number and volume per component/application). They should also indicate what choices have been or will be made on the basis of the action plan and analysis and what "benefits" they yield in terms of reducing the quantity of materials required.

There will be a qualitative assessment of the action plan. A maximum of 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

The evidence that has to be provided

The applicant must submit an action plan and/or a life cycle analysis showing how it has investigated the possible choices of materials and the impact of the choices made on the quantity of materials to be used (expressed in m^2, m^3 and/or kg/ton) during construction and as a result of replacement and/or maintenance thoughout the building's life cycle for the elements listed below. The analysis should preferably also contain conclusions and arguments for the the choice of the option ultimately included in the design. The relevant building components/ elements are the main load-bearing structure, roofs, closed façades, open façades / openings in façades, interior walls, mechanical equipment, floor finishes, wall finishes and ceiling finishes.

How the information/evidence provided will be tested and assessed on submission of application (during the selection procedure)

The municipality will assess whether the requested action plan and/or analysis has been submitted and complies with the specified requirements/criteria. It will also be determined whether the submitted design corresponds with the conclusions in the analysis for the relevant elements.

Description of how performance will be tested and assessed after the application (later in the process/life cycle)

There may be verification that the MPG calculation was submitted and that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion of the building.

MATERIALS | CIRCULAR INDICATORS

Theme: Materials Type of indicator: Process	2. Environmental impact of procured materials (EIPM)
This indicator evaluates various aspects of the environmental impact of the materials procured for the building, including emissions of particulate matter and greenhouse gases.	
Relevance in the circular economy	Reducing the total quantity of materials used is not a goal in itself: the ultimate objective is to mitigate the impact caused by the use of materials in respect of climate change, resource depletion, and human and ecological toxicity.
Evidence for indicator	With the design, the builder and developer must submit the associated material passport, in which the data are linked to the impact factors used in existing standards. The developer may also choose to perform its own building-specific impact analysis (Life Cycle Inventory, LCI).
Calculation of indicator	EIPM = type and quantities of materials in building passport x MPG factors or EIPM = type and quantities of materials in building passport x MPG factors in building-specific LCA

Data			
Required data per metric:	Material passport (total in tonnes per type) Final design	**Owner of data:**	Builder/developer, BREEAM Assessor

Stage of the life cycle at which indicator can be calculated: **design phase**

Information for Tender Team

Specific objective (to be formulated in the request for tender)

The environmental impact of materials being used must be kept to a minimum during the entire life cycle of the building, not only during construction but also during maintenance and replacement and on the demolition and further processing of elements/materials at the end of their life cycle. The environmental impact can be expressed in the form of environmental costs. Performing an Environmental Performance of Buildings calculation is mandatory for new-build homes (and buildings for some other functions) by virtue of Article 5.9 of the Building Decree (*Bouwbesluit*).

Description of minimum requirement (ground for exclusion)

With the design, the applicant must submit an Environmental Performance of Buildings (MPG) calculation, containing an estimate of the environmental costs of the development, expressed in euros per m² gross floor area (GFA) per year, based on the design and accompanying specifications and quantities. The calculation of the environmental performance must be produced by an expert and based on the current or most recent version of the National Environmental Database. Software is available from BREEAM and/or GPR Building to perform the calculations.

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

The reference value for the environmental costs of a residential building is 0.70 euro per m² GFA per year. The values if the calculation shows that the environmental costs of the development will be lower are as follows:

MPG calculation below reference value: <= 10% below reference, is >= 0.63 euro per GFA m² per year 1 point (or 10 points with a score up to 100)

MPG calculation below reference value: <= 20% below reference, is >= 0.56 euro per GFA m² per year 2 points (or 25 points with a score up to 100)

MPG calculation below reference value: <= 30% below reference, is >= 0.49 euro per GFA m² per year 3 points (or 40 points with a score up to 100)

MPG calculation below reference value: <= 40% below reference, is >= 0.42 euro per GFA m² per year 4 points (or 60 points with a score up to 100)

MPG calculation below reference value: <= 50% below reference, is >= 0.35 euro per GFA m² per year 5 points (or 80 points with a score up to 100)

MPG calculation below reference value: > 50% below reference, is >= 0.35 euro per GFA m² per year 6 points (or 100 points = maximum)

QUALITATIVE SCORING

Not applicable

The evidence that has to be provided

The applicant must submit an Environmental Performance of Buildings (MPG) calculation and demonstrate that it was carried out by an expert. The applicant must also provide a specification of the work involved in implementing the design, which must also be submitted, explicitly showing what materials will be used and in what quantities. It must accompanied by an explanation of how this is translated in the choices used in the MPG calculation, on the basis of or with the use of the National Environmental Database.

How the information/evidence provided will be tested and assessed on submission of application (during selection procedure)

The municipality will assess whether the requested action plan and/or analysis has been submitted and complies with the specified requirements/criteria. It will also be determined whether the submitted design corresponds with the specifications and quantities entered in the MPG for the relevant elements.

Description of how performance will be tested and assessed after the application (later in the process/lifespan)

There may be verification that the MPG calculation was submitted and that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion of the building.

MATERIALS | CIRCULAR INDICATORS

Theme: Materials **Synergize** **Type of indicator: Process**	**3. Design for Disassembly (DfD)**
This indicator evaluates the extent to which the submitted design facilitates disassembly (for the purpose of replacing, repairing or recovering components).	
Relevance in the circular economy	In a circular economy, materials are reused at the highest possible value. Taking account of the disassembly of products and components in the building at the design stage can ensure that they can be removed and replaced in their entirety and do not have to be degraded to their component materials (downcycling).
Evidence for indicator option 1	Qualitative estimate: Whether the design takes account of the principles of design for disassembly will be assessed on the basis of the final design submitted by the builder and developer. There are ten important principles of design for disassembly (Brad & Ciarimboli, 2005) that need to be considered in the design of a product of building. 1. Document materials and methods for deconstruction: as-built drawings, labelling of connections and materials, and a "deconstruction plan" in the specifications all contribute to efficient disassembly and deconstruction; 2. Select materials using the precautionary principles: materials that are chosen with a view to future impacts and that have high quality will retain value and/or be more feasible for reuse and recycling; 3. Design connections that are accessible: visually, physically and ergonomically accessible connections will increase and avoid requirements for expensive equipment or extensive environmental health and safety procedures; 4. Minimize or eliminate chemical connections: binders, sealers and glues on or in materials make them difficult to separate and recycle, and increase the potential for negative human and ecological health impacts during their use; 5. Use bolted, screwed or nailed connections: using a limited range of standard connections reduces the need to use equipment and the time required for disassembly; 6. Separate mechanical, electrical and plumbing systems: disentangling these systems from assemblies that host them makes it easier to separate components and materials for repair, replacement, reuse or recycling; 7. Consider the labour and specialization required in the design of cut-off points: the labour intensity and the skills required decline by choosing human-scale components or designing them for easy removal with standard mechanical equipment; 8. Simplicity of structure and form: simple open-span structural systems, simple forms and standard dimensional grids will allow for easy step-by-step construction and deconstruction; 9. Interchangeability: using materiasl and system with modular, independent and standard charactersitics facilitates their reuse; 10. Safe deconstruction: allowing workers to move safely, access to equipment and the site, and ease of materials flow will make renovation and disassembly more economical.
Evidence for indicator option 2	Quantitative assessment: whether the design takes account of Design for Disassembly principles will be assessed on the basis of the final design submitted by the builder and developer. Eight design principles have been defined, based in part on the above principles, which could make elements easier to disassemble. A score of 0, 1, 2 or 3 points can be awarde d for each element, in ascending order according to the extent to which the relevant element takes account of the principles of design for disassembly.
Calculation of indicator option 1	(DfD) = 10 points out of 100 x number of principles that the assessor determines have been followed in the final design.
Calculation of indicator option 2	(DfD) = minimum 0, maximum 8 x 3 = 24 points; the larger the number of elements that are substantially based on the principles of design for disassembly, the higher the score.

Data

Required data per metric:	Material passport (total in tonnes per type) Types of connections Final design	**Owner of data:**	Builder/developer

Stage of the life cycle at which indicator can be calculated: **design phase**

Information for Tender Team

Specific objective (to be formulated in the request for tender)

In a circular economy, materials are reused at the highest possible value. Taking account of the disassembly of products and components in the building at the design stage can ensure that they can be removed and replaced in their entirety and do not have to be degraded to their component materials (downcycling).

Description of minimum requirement (ground for exclusion)

Not applicable

Description of how points can be earned, up to the maximum score

MATERIALS | CIRCULAR INDICATORS

QUANTITATIVE SCORING

The principles of Design for Disassembly must be applied for eight different elements and connections in the building where there are joints between elements. For each element, the applicant must provide design drawings,and/or descriptions and specifications to demonstrate how and to what extent the specified criteria will be met. The applicant's score for each component and total score will be determined on the basis of these documents and further evidence. Minimum score = 0 points. Maximum score = 100 points.

Distinction between base building structure and fit out

To what extent does the building's design make a distinction between the base building (structural building elements with a lengthy functional lifespan) and fit out (building elements with a short functional lifespan, which can be easily replaced without damaging the base building)?

Value in % of fit out	< 10%	0 points
	10% - 30%	5 points
	30% - 50%	10 points
	>50%	15 points

The more building components that are part of the fit out, the greater the building's adaptability and versatility.

Movable partition walls

How easily can partition walls be moved?

Interior walls are:	1. immovable without major/expensive construction measures	0 points
	2. immovable, but dismantable.	5 points
	3. movable by dismantling and rebuilding them.	10 points
	4. easily movable without major/expensive construction measures (e.g., system walls)	15 points.

The easier it is to move interior walls, the greater the building's adaptability and versatility.

Deconstructable façades

To what extent can façade components be deconstructed during transformation?

1. Façade components are almost impossible to deconstruct and have to be entirely demolished and removed (<20%). 0 points

2. A small proportion of the wall components can be deconstructed (between 20 and 50%). 5 points

3. A large proportion of the wall components can be deconstructed (between 50 and 90%). 10 points

4. All wall components can be almost entirely deconstructed (90%). 15 points

The more elements of the façade that are demountable, the greater the building's flexibility, adaptability and transformability or the possibilities for its reuse.

Connection detailing of partition walls

What detailing is used at the junction of interior walls and walls/columns/façade?

1. Penetrating joints.	0 points
2. Wet joints (such as mortar and/or grouting).	3 points
3. Specific project-related coupling pieces.	7 points
4. Project-unrelated demountable coupling pieces.	11 points

The easier it is to decouple the connection detailing, the greater the building's versatility.

Interchangeability of fit out elements

To what extent can walls, doors, ceilings, etc. be used elsewhere in the building?

1. No possibilities to move/swap elements of fit out such as walls, floors, ceilings.	0 points
2. < 50% moveable/interchangeable.	3 points
3. 50 - 80% moveable/interchangeable.	7 points
4. All walls, (lowered) ceilings and (raised) floors are easily movable and and interchangeable.	11 points

The greater the mutual interchangeability of fit-out elements, the greater the building's versatility.

The extent to which installation components can be disassembled?

How easy is it to disassemble the components of installations ?

1. Not disconnectable or demountable.	0 points
2. Poorly disconnectable or demountable.	3 points
3. Partially disconnectable or demountable.	7 points
4. Highly disconnectable or demountable (totally demountable, pluggable)	11 points

The easier it is to disconnect components of installations, the greater the possibilities to rearrange and/or transform a building for other functions.

Connection detailing of façade elements

What detailing is used for the façade/gable-end components?

1. Penetrating joints.	0 points
2. Wet joints (such as mortar and/or grouting).	3 points
3. Specific project-related coupling pieces.	7 points
4. Project-unrelated demountable coupling pieces.	11 points

The easier it is to disconnect the façade elements, the easier it is to expand the building.

Total score **... points** **minimum 0, maximum 100 points**

QUALITATIVE SCORING

MATERIALS | CIRCULAR INDICATORS

Qualitative projection: whether the design takes account of the principles of design for disassembly will be assessed on the basis of the final design submitted by the builder and developer.

There are ten major principles of design for disassembly (Brad & Ciarimboli, 2005) that have to be considered in designing a product or building.

The more clearly the applicant can demonstrate that these principles, or alternative principles for innovative design, have been taken into account, the higher the score.

There will be a qualitative assessment of the action plan. A maximum of 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

The evidence that has to be provided

The applicant must submit an action plan and/or design drawings and detailing of the specified elements (provided the applicant wishes to receive a score for this indicator). A brief description and/or specification with further underpinning how the relevant element will be implemented must also be submitted.

How the information/evidence provided will be tested and assessed on submission of application (during selection procedure)

The municipality will assess whether the action plan and/or drawings and supporting documents have been submitted and comply with the specified requirements/criteria. It will also be determined whether the design and further documentation meet the specified criteria for each element. The score for each component and the total score for this indicator will be determined on the basis of this assessment.

Description of how performance will be tested and assessed after the application (later in the process/lifespan)

There may be verification that the MPG calculation was submitted and that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion of the building.

MATERIALS | CIRCULAR INDICATORS

Theme: Materials **Synergize** **Type of indicator: Processt**	**4. Theoretical reusability of materials or elements at equivalent level of quality (HM)**

This indicator evaluates the extent to which the design plausibly shows that elements and materials can be reused and recovered with equivalent functionality at the end of their functional lifespan.

Relevance in the circular economy	In a circular economy, materials are reused at the highest possible value. Taking account of the recovery and reuse of products and building elements in the design can prevent them from having to be broken down into materials (downcycling) or materials becoming mixed in such a way that they can only be recovered as mixed waste rather than as pure energy.
Calculation or evidence for indicator	The builder and developer must provide the following data: - Type and weight of materials per building element - Method of assembly / construction of each element - Estimated functional lifespan of each element - Estimated functional lifespan of the building as a whole We use these data to project: - the risk of damage during disassembly for repair or replacement (minor, average, major) • the theoretical resuability of every element: (as an element, as a high-value material, as a low--value material)
Calculation of score	HM = Total weight of materials and elements used in the building / (total weight of undamaged elements that can theoretically be recovered for high-value reuse + 0.5 x total weight of elements and materials that can only be reused damaged or as a material) The score is then determined on the basis of a sigmoid function and benchmarking.

Data

Necessary data per metric:	Material passport (total in tonnes per type) Final design Plan for recovery and reuse of materials	**Owner of data:**	Builder/developer

Phase of the life cycle at which the indicator can be calculated: **design phase**

Information for Tender Team

Specific objective (to be formulated in request for tender)

In a circular economy, materials are reused at the highest possible value. Taking account of the recovery and reuse of products and building elements in the design can prevent them from having to be broken down into materials (downcycling) or materials becoming mixed in such a way that they can only be recovered as mixed waste rather than as pure energy.

Description of minimum requirement (ground for exclusion)

MATERIALS | CIRCULAR INDICATORS

With the design, the applicant must submit an Environmental Performance of Buildings (MPG) calculation, containing an estimate of the environmental costs of the development, expressed in euros per m^2 gross floor area (GFA) per year, based on the design and accompanying specifications and quantities. The calculation of the environmental performance must be produced by an expert and based on the current or most recent version of the National Environmental Database. Software is available from BREEAM and/or GPR Building to perform the calculations.

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

To supplement the MPG calculation, the applicant can submit a list of the elements/materials whose theoretical reusability can be determined. The more elements and the greater the volume/weight, the higher the potential score:

The applicant must determine the total weight/volume of all elements/ materials used on the basis of the MPG calculation	
The applicant must also provide a list of building components/elements whose future theoretical resusability has been determined In this list the applicant must specify the composition of the element, the method of attachment/assembly and the projected functional lifespan of the element/ application.	
The chance of disassembly in the event of repair or replacement and the theoretical reusability of elements will be determined on the basis of these data.	By the assessor (!)
<u>The result is a score that is calculated as follows:</u>	
* Calculated/estimated quantity (volume/weight) of elements that are theoretically fit for undamaged and high-value reuse	**A** (for example, 100 tonnes)
* Calculated/estimated quantity (volume/weight) of elements that are theoretically only fit for damaged or low-value reuse or as materials	**B** (for example, 300 tonnes)
* Calculated quantity (volume/weight) of all the building's elements/materials (based on MPG)	**C** (for example, 1,250 tonnes)

SCORE:	**HM = 100% x ((A + 0.5 * B) / C)**	provisionally expressed in % (in example: 20%)
	score = ...% x 100 points (maximum 100 points)	100% x ((100 + 0.5 * 300) / 1,250)

QUALITATIVE SCORING

Qualitative estimate: on the basis of a vision / action plan submitted by the applicant and proposed design choices and solutions, the extent to which the design takes account of the theoretical future reusability of materials and elements will be assessed

There will be a qualitative assessment of the action plan. Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

The evidence that has to be provided

The applicant must submit an Environmental Performance of Buildings (MPG) calculation (which is required when applying for an environmental permit), with a list of all the elements and materials used in the building (which is also input for the MPG calculation, see also point 2). The applicant must also provide a list of the parts/elements of the building whose theoretical reusability in the future will be determined (the applicant has to specify the parts/elements for which it has to be determined: the larger the number, the higher the possible score). The following data must be provided for these elements (per main application): type and quantity of material (kg/ton), composition of element, method of attachment/assembly (see also point 3) and estimated functional lifespan of the application or element. Design drawings and detailing of the element must also be submitted as underpinning of the MPG calculation and the list.

Description of how the information/evidence supplied will be tested and assessed on submission of application (during selection procedure)

The municipality will assess whether the requested list and the drawings and supporting information have been provided and meet the prescribed requirements/criteria. On the basis of the documents provided, an assessment/estimate will also be made of the risk of damage occurring to the element during repair or replacement (3 levels: minior risk, average risk, major risk) and of the theoretical reusability of the element/materials after disassembly (3 levels: reusable as component, reusable as high-value material, reusable as low-value material). The score for each component of this indicator and for the indicator as a whole will be determined on the basis of this assessment.

Description of how performances will be tested and assessed after the application (later in the process/lifespan)

There may be verification that the MPG calculation was submitted and that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion of the building.

MATERIALS | CIRCULAR INDICATORS			
Theme: Materials **Reduce** **Type of indicator: Product**	**5. Use of secondary materials for building (SM)**		
This indicator gives a score based on the total quantity of secondary (reused) materials used in the construction of the building.			
Relevance in the circular economy	In a circular economy, the main priority, after reducing material use, is to reuse materials rather than extracting and using primary resources.		
Calculation or evidence for indicator	In addition to a material passport, the applicant must provide information about the source of the materials used in the building or the certification from suppliers showing that the materials are wholly or partially recycled.		
Calculation of score	SM = *Total mass of used materials / total mass of used materials demonstrably from reuse* A realistic range between a minimum and maximum values for the score for the tender has still to be determined. The formula is: (V - MINV) / (MAXV - MINV)		
Data			
Necessary data per metric:	Material passport (total materials in tonnes per type per component) Total projected functional lifespan of elements and building Certification of source of materials	**Owner of data:**	Builder/developer Purchaser
Phase of the life cycle at which the indicator can be calculated: **design phase**			

Information for Tender Team
Specific objective (to be formulated in request for tender)
In a circular economy, the main priority, after reducing material use, is to reuse materials rather than extracting and using primary resources. For this indicator, the larger the quantity of secondary materials used in the elements/materials for the new building, the higher the score.
Description of minimum requirement (ground for exclusion)
With the design, the applicant must submit an Environmental Performance of Buildings (MPG) calculation, containing an estimate of the environmental costs of the development, expressed in euros per m^2 gross floor area (GFA) per year, based on the design and accompanying specifications and quantities. The calculation of the environmental performance must be produced by an expert and based on the current or most recent version of the National Environmental Database. Software is available from BREEAM and/or GPR Building to perform the calculations.
Description of how points can be earned, up to the maximum score
QUANTITATIVE SCORING

MATERIALS | CIRCULAR INDICATORS

To supplement the MPG calculation, the applicant can submit a list of the elements/materials in which secondary materials are used, together with the weight/volume..

In this list, the applicant must specify the composition of the element/material, together with the (envisaged) source / supplier and supporting certificates and/or declarations. This information must also show the percentage of secondary materials per element/material

a single percentage per application

The applicant must determine the total weight/volume of all elements/materials used, on the basis of the MPG

The quantity of secondary materials used will be calculated on the basis of this data.

Note! If weight counts or is used as reference

.... what about insulation material?

The resulting score is calculated as follows:

* Calculated /estimated quantity (volume/weight) of elements with aggregates different

A (for example, 750 ton, as total of x elements in which secondary materials are used)

* Calculated /estimated weighted quantity of secondary material in the relevant elements/materials (A)

B (for example, 100 ton x 10% + 250 ton x 20% +100 ton x 40% + 200 ton x 5% + 50 ton x 50% + 50 ton x 30% = 150 ton

* Calculated quantity (volume/weight) of all elements/materials of the building (based on MPG)

C (for example, 1,200 ton)

SCORE: **M = B / C** provisionally expressed in % (in example: 12.5%)

score = ...% x 100 points (maximum 100 points)

C = 150 / 1,200 = 12.5%

QUALITATIVE SCORING

To supplement the MPG calculation, the applicant must submit a vision/action plan and proposals for design choices and solutions showing how, to what extent and in which elements seconday materials will be used in the development.

There will be a qualitiative assessment of the action plan. Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

The evidence that has to be provided

The applicant must submit an Environmental Performance of Buildings (MPG) calculation (which is required when applying for an environmental permit), with a list of all the elements and materials used in the building (which is also input for the MPG calculation, see also point 2). The applicant must also provide a list of the parts/elements of the building whose theoretical reusability in the future will be determined (the applicant has to specify the parts/elements for which it has to be determined: the larger the number, the higher the possible score). The following data must be provided for these elements (per main application): type and quantity of material (kg/ton), composition of element, method of attachment/assembly (see also point 3) and estimated functional lifespan of the application or element. Design drawings and detailing of the element must also be submitted as underpinning of the MPG calculation and the list.

Description of how the information/evidence supplied will be tested and assessed on submission of application (during selection procedure)

The municipality will assess whether the requested list and the drawings and supporting information have been provided and meet the prescribed requirements/criteria. The outcome of the calculations (percentage) submitted by the applicant will be assessed. If approved, that percentage will be used to determine the number of points earned for this indicator.

Description of how performances will be later tested and assessed after the application (later in the process/lifespan)

There may be verification that the MPG calculation was submitted and that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion of the building.

MATERIALS | CIRCULAR INDICATORS

Theme: Materials **Reduce** **Type of indicator: Process**	**6. Reuse of earth and residual streams during construction (HC)**

This indicator evaluates the extent to which earth and building and demolition waste released during construction will be reused on-site.

Relevance in the circular economy	In a circular economy, materials are reused locally and at the highest possible value in order to avoid wastage of residual streams and needless transport.

MATERIALS | CIRCULAR INDICATORS			
Calculation or evidence for indicator	In addition to the material passport, the builder and developer must submit a plan for the reuse of residual streams released during construction. HC = Total weight of earth and materials released during construction / total weight of earth and materials released during construction for which reuse is guaranteed in the plan. A realistic range between a minimum and maximum values for the score for the tender has still to be determined. The formula is: (V - MINV) / (MAXV - MINV)		
Calculation of score			
Data			
Necessary data per metric:	Material passport (total in tonnes per type) Final design Plan for reuse of materials and earth during construction	**Owner of data:**	Builder/developer

Stage of the life cycle at which indicator can be calculated: **procurement/construction**

Information for Tender Team

Specific objective (to be formulated in request for tender)

In a circular economy materials are reused at the highest possible value and locally to avoid wastage of residual streams and needless transport.

Description of minimum requirement (ground for exclusion)

With the design, the applicant must submit an Environmental Performance of Buildings (MPG) calculation, containing an estimate of the environmental costs of the development, expressed in euros per m² gross floor area (GFA) per year, based on the design and accompanying specifications and quantities. The calculation of the environmental performance must be produced by an expert and based on the current or most recent version of the National Environmental Database. Software is available from BREEAM and/or GPR Building to perform the calculations. This calculation includes the list of materials and elements to be used, with the associated quantities, which form the basis for the further analysis and the requested action plan for this indicator.

Description of how points can be earned, with scores rising to the maximum score

QUANTITATIVE SCORING

Not applicable

QUALITATIVE SCORING

To supplement the MPG calculation, the applicant can submit an action plan for waste management on the building site containing some or all of the following elements (at the discretion of the applicant) (reference / example: BREEAM-NL-2014, WST 1, Waste management on the construction site):

* An analysis of the waste that could be released during construction on the basis of the material passport

* An indication of the measures that can or will be taken to minimize the volume of waste during construction

* An indication of how waste released during construction will be dealt with, including separation of the waste, reuse of the waste on the building site, removal of waste from the construction site and the destination and further reuse or processing of the waste. The removal of waste/materials from the construction site should be kept to a minimum.

* Evidence that, if demolition will be carried out during the development, methods of minimizing the volume of waste that is released have been investigated by means of (in order of priority): investigation of the feasbility of renovation; investigation of high-value reuse of elements/materials on the site followed by the analyses mentioned in the preceding points.

There will be a qualitiative assessment of the action plan. Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

Description of what has to be supplied to demonstrate this

The applicant must submit an Environmental Performance of Buildings (MPG) calculation (which is required when applying for an environmental permit), with a list of all the elements and materials used in the building (which is also input for the MPG calculation, see also point 2). On the basis of these data, the applicant must draft an action plan for waste management on the construction site, which includes the points referred to above.

Description of how the information/evidence provided will be tested and assessed on submission of application (during selection procedure)

The municipality will make a qualitative assessment of the action plan for waste management on the construction site, with the outomce expressed as a score.

MATERIALS | CIRCULAR INDICATORS

Description of how performance will be tested and assessed after the application (later in the process/lifespan)

There may be verification that the MPG calculation was submitted and that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion of the building.

MATERIALS | CIRCULAR INDICATORS

Theme: Materials **Type of indicator: Process**	**7. Policy on circular contracting with fitters (CCI)**		
This indicator gives a score for the extent to which the contracts with suppliers and the types of contract enable the builder and developer to reuse elements and materials.			
Relevance in the circular economy	A circular economy calls for new forms of collaboration in the chain that ensures the recovery and high-value reuse of elements and materials. This can be accomplished by choosing forms of contract that properly allocate the costs and benefits of reuse at the end of the functional lifespan, as is usual, for example, with 'product as a service' contracts.		
Calculation of evidence indicator	The builder and developer must provide evidence in the form of contracts with suppliers and producers clearly showing that they themselves or a third party assumes responsibility for high-value reuse at the end of the functional lifespan. CC = suppliers (in € turnover) that use forms of circular contracting / total turnover of suppliers of components and materials		
Calculation of score			
Data			
Necessary data per metric:	Contracts with suppliers List of suppliers	**Owner of data:**	**Suppliers and producers** Builders

Phase of the life cycle at which the indicator can be calculated: **design phase**

Information for Tender Team

Specific objective (to be formulated in the request for tender)

A circular economy calls for new forms of collaboration in the chain that ensures the recovery and high-value reuse of elements and materials. This can be accomplished by choosing forms of contract that properly allocate the costs and benefits of reuse at the end of the functional lifespan, as is usual, for example, with 'product as a service' contracts.

Description of minimum requirement (ground for exclusion)

Not applicable

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

Not applicable

QUALITATIVE SCORING

The applicant must submit an action plan for selecting, contracting with and monitoring the parties that will be involved in the construction and later management and maintenance of the building's installations or building elements (fitters, contractors, suppliers, maintenance firms, etc.). The plan should focus specifically on the circularity of the elements and materials to be used in the relevant building elements from their production, delivery, installation/construction, management and maintenance up to and including disassembly and the return/disposal of the elements and materials concerned, including the accompanying contractual agreements with the parties.

There will be a qualitative assessment of the action plan. Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

The evidence that has to be provided

The applicant must submit an action plan for selecting, contracting with and monitoring the parties that will be involved in the construction and later management and maintenance of the building's installations or building elements.

Description of how the information/evidence provided will be tested and assessed on submission of the application (during selection procedure)

MATERIALS | CIRCULAR INDICATORS
The municipality will make a qualitative assessment of the action plan, with the outcome expressed as a score.
Description of how performances will be later tested and assessed after the application (later in the process/lifespan)
There may be verification that the MPG calculation was submitted and that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion of the building.

MATERIALS | CIRCULAR INDICATORS

Theme: Materials **Type of indicator: Process**	**8. Sustainable procurement of materials: Certification of purchased renewable materials and metals (DIM).**		
This indicator evaluates the extent to which materials and components procured for the building are shown to be responsibly sourced.			
Relevance in the circular economy	It is known that the extraction of some types of material, particularly wood in the case of renewable building materials and non-renewable materials from mining, can cause major social and ecological impacts. In a circular economy, active efforts must be made to minimize the impacts from the use of these materials throughout the supply chain.		
Calculation or evidence for indicator	The builder or purchaser must demonstrate that the extraction and production of all the wood and metals used for construction was conducted in a responsible manner by means of certification or information received directly from the supplier.		
Calculation or evidence for indicator	CM = total projected weight of materials in construction and design / total projected weight of materials in construction and design demonstrably from responsible sources A realistic range between a minimum and maximum values for the score for the tender has still to be determined. The formula is: (V - MINV) / (MAXV - MINV)		
Data			
Necessary data per metric:	Material passport (total in tonnes per type) Certification	**Owner of data:**	Builder/developer, Purchaser / Suppliers
Phase of the lifecycle at which indicator can be calculated: **procurement/construction**			

Information for Tender Team
Specific objective (to be formulated in request for tender)
It is known that the extraction of some types of material, particularly wood in the case of renewable building materials and non-renewable materials from mining, can cause major social and ecological impacts. In a circular economy, active efforts must be made to minimize the impacts from the use of these materials throughout the supply chain.
Description of minimum requirement (ground for exclusion)
With the design, the applicant must submit an Environmental Performance of Buildings (MPG) calculation, containing an estimate of the environmental costs of the development, expressed in euros per m^2 gross floor area (GFA) per year, based on the design and accompanying specifications and quantities. The calculation of the environmental performance must be produced by an expert and based on the current or most recent version of the National Environmental Database. Software is available from BREEAM and/or GPR Building to perform the calculations. Software is available via BREEAM and/or GPR Building to make these calculations. This calculation includes the list of materials and elements to be used, with the associated quantities.
Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

MATERIALS | CIRCULAR INDICATORS

To supplement the MPG calculation, the applicant can submit a calculation showing how much of the used materials are shown to responsibly sourced.

The reference and the calculation tool to be used for this indicator is BREEAM-NL-2014, MAT 5, Responsible sourcing of materials.

Encouraging the use of responsibly sourced materials for key building elements. Calculation tool: http://www.breeam.nl/hulp/credit/mat_5

Evidence provided shows that at least 80% of the volume of materials used (see list of applicable materials below) in each of the following main building elements are responsibly sourced:

a. structural frame
b. ground floor
c. upper floors
d. roof
e. external walls
f. internal walls
g. foundation
h. staircase

List of applicable materials:

a. Brick (including clay tiles and other ceramics)
b. Resin-based composites and materials, including fibreglass-reinforced composites and polymeric render
c. Concrete (including in-situ and pre-cast concrete, blocks, tiles, mortars and cementious renders)
d. Glass
e. Plastics and rubbers (including EPDM, TPO, PVC and VET roof membranes)
f. Metals (steel, aluminium, etc.)
g. Dressed or building stone, including slate
h. Timber sheet timber (including MDF, OSB and cement-bonded particleboard)
i. Plasterboard and plaster
j. Bituminous materials, such as roofing membranes and asphalt
k. Other mineral-based materials, including fibre cement and calcium silicate
l. Products with recycled content
m. Insulation materials (insulation of the shell and of installation components)

There must also be evidence that any wood used that is not certified is legally sourced and is not of a species that appears on the CITES list

Data required for the MAT 5 calculation tool: Material passport/MPG/complete list of materials/elements in the building
- Breakdown of main building elements
- Specification of the number of elements making up the main building element
- A list of the names of the elements making up the the main building element
- The total volume of each element
- The volume of each material present in the element (these add up to the total volume of the element, see previous item)
- The Tier-level of all materials, as far as it is known and can be entered
- *the more that can be entered and the lower their tier level, the higher the score*

SCORE: With the MAT 5 tool, from 1 to a maximum of 5 points can be earned.
This score is multiplied by 20 points — Maximum 5 x 20 = 100 points

QUALITATIVE SCORING

To supplement the MPG calculation, the applicant can submit an action plan for procurement and for ensuring the responsible sourcing of materials with the best possible environmental performance (environmental impact, criteria for sustainable procurement, Cradle to Cradle and other certification from producers/suppliers).

There will be a qualitative assessment of the action plan. Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

The evidence that has to be provided

The applicant must submit an Environmental Performance of Buildings (MPG) calculation (which is required when applying for an environmental permit), with a list of all the elements and materials used in the building (which is also input for the MPG calculation, see also point 2). On the basis of these data, the applicant must submit a calculation produced with the calculation tool MAT 5 (BREEAM NL-2014) showing the extent to which the materials to be used are responsibly sourced.

Description of how the information/evidence provided will be tested and assessed on submission of the application (during selection procedure)

The municipality will assess the MAT 5 (BREEAM) calculation and the outcomes and award points on the basis of the results.

Description of how performances will be tested and assessed after the application (later in the process/lifespan)

There may be verification that the MPG calculation was submitted and that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion of the building.

MATERIALS | CIRCULAR INDICATORS			
Theme: Materials **Type of indicator: Process**	**9. Use and capture of scarce and critical materials (KM)**		
This indicator evaluates the extent to which the design endeavours to avoid the use of scarce and critical materials.			
Relevance in the circular economy	It is known that the economically recoverable stocks of certain types of non-renewable materials, particularly many metals, are becoming depleted and that there are no good substitutes for them. In a circular economy, the use of such materials should be avoided, especially if they will be locked into buildings for a lengthy period.		
Calculation or evidence for indicator	The European Union has drawn up a list of critical materials, which can be used, in combination with a material passport, to review the extent to which they are used during construction. KM = total projected weight of materials in construction and design / total projected weight of critical materials in construction and design		
Data			
	Material passport (total in tonnes per type) Final design List of critical materials	**Owner of data:**	Builder/developer, European Commission (See this link)

Information for Tender Team
Specific objective (to be formulated in request for tender)
It is known that the economically recoverable stocks of certain types of non-renewable materials, particularly many metals, are becoming depleted and that there are no good substitutes for them. In a circular economy, the use of such materials should be avoided, especially if they will be locked into buildings for a lengthy period.
Description of minimum requirement (ground for exclusion)
With the design, the applicant must submit an Environmental Performance of Buildings (MPG) calculation, containing an estimate of the environmental costs of the development, expressed in euros per m^2 gross floor area (GFA) per year, based on the design and accompanying specifications and quantities. The calculation of the environmental performance must be produced by an expert and based on the current or most recent version of the National Environmental Database. Software is available from BREEAM and/or GPR Building to perform the calculations.
Description of how points can be earned, up to the maximum score
QUANTITATIVE SCORING
Not applicable.
QUALITATIVE SCORING
To supplement the MPG calculation, the applicant can submit an action plan explaining how it intends to avoid the use of scarce materials and resources, in particular raw materials that appear on the list of critical materials compiled by the European Commission (April 2017 version; Revised Critical Raw Materials List of 26 May 2014), which contains a list of resources that are scarce and should therefore not be used virgin raw materials. The action plan can address specific choices of materials and the procedures for selecting suppliers, producers/products and the procurement process to show how the objective of avoiding the use of critical materials will be achieved. There will be a qualitative assessment of the action plan. Maximuum 100 ponts (0, 4, 6, 8 of 10 (= assessment score) x 10 points)
The evidence that has to be provided
The applicant must submit an Environmental Performance of Buildings (MPG) calculation (which is required when applying for an environmental permit), with a list of all the elements and materials used in the building (which is also input for the MPG calculation, see also point 2), which is linked to an action plan showing how it intends to avoid or limit the use of scarce and/or critical materials.
Description of how this information/evidence supplied will be tested and assessed immediately after application (during selection procedure)
The municipality will perform a qualitiative assessment of the action plan for avoiding or limiting the use of scarce or critical materials, with the outomce expressed as a score.
Description of how performances will be later tested and assessed immediately after the application (later in the process/lifecycle)
There may be verification that the MPG calculation was submitted and that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion of the building.

MATERIALS | CIRCULAR INDICATORS

Theme: Materials **Reduce** **Type of indicator: Product**	**10. Use of renewable materials (BBM)**

This indicator gives a score for the use of renewable (or 'biobased') building materials.

Relevance in the circular economy	In a circular economy, the use of renewable materials (provided they are sustainably produced!) is preferred to the use, and hence depletion, of non-renewable materials.
Calculation or evidence for indicator	HM = total projected weight of renewable materials in construction and design / total projected weight of materials in construction and design

Data

Necessary data per metric:	Material passport (total materials in tonnes per type per component) Technical lifespan of components and building as a whole Total number of residential units	**Owner of data:**	Designer Builder/developer

Phase of the life cycle at which indicator can be calculated: **design phase**

Information for Tender Team

Specific objective (to be formulated in request for tender)

In a circular economy, the use of renewable materials (provided they are sustainably produced!) is preferred to the use, and hence depletion, of non-renewable materials.

Description of minimum requirement (ground for exclusion)

With the design, the applicant must submit an Environmental Performance of Buildings (MPG) calculation, containing an estimate of the environmental costs of the development, expressed in euros per m^2 gross floor area (GFA) per year, based on the design and accompanying specifications and quantities. The calculation of the environmental performance must be produced by an expert and based on the current or most recent version of the National Environmental Database. Software is available from BREEAM and/or GPR Building to perform the calculations.

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

To supplement the MPG calculation, the applicant can provide a list of the renewable elements/materials to be used, together with their weight/volume.

The applicant must specify the composition of the element/material in the list, together with the (envisaged) source / supplier and supporting certificates and/or declarations.		a single percentage per application
On the basis of the MPG, the applicant must determine the total weight/volume of all elements/materials used		
The quantity of renewable materials used is calculated on the basis of these data. be		For insulating materials, volume in m^3 can used instead of kg or ton.
The resulting score is calculated as follows:		
* Calculated/estimated quantity (volume/weight) of elements composed of renewable material elements		**A** (e.g., 240 ton, as total of x different of renewable materials
* Calculated quantity (volume/weight) of all elements/materials in the building (based on MPG)		**B** (e.g., 1,200 ton)
SCORE: 20%)	**BBM = A / B**	provisionally expressed as % (in example:
	score = ...% x 100 points (maximum 100 points)	BBM = 240 / 1,200 = 20%

QUALITATIVE SCORING

To supplement the MPG calculation, the applicant can submit an action plan, possibly including proposals for design choices and solutions, showing how, to what extent and for which elements renewable materials can or will be used in the development.
There will be a qualitative assessment of the action plan. Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

Evidence that has to be provided

MATERIALS | CIRCULAR INDICATORS

The applicant must submit an Environmental Performance of Buildings (MPG) calculation (which is required when applying for an environmental permit), with a list of all the elements and materials used in the building (which is also input for the MPG calculation, see also point 2), together with a list of all the elements and materials being used in the building (which is also input for the MPG calculation, see also point 2). The applicant must also provide a list of all the building parts/elements comprised of renewable materials together with the following details (for each principal application): type and quantity of material (kg/ton) and composition of the element. Design drawings and main details of those elements must also be provided as underpinning of the MPG calculation and the list of elements.

Description of how this information/evidence supplied will be tested and assessed on submission of the application (during selection procedure)

The municipality will assess whether the requested list and the drawings and supporting information have been provided and meet the prescribed requirements/criteria. The outcome of the calculations (percentage) made by the applicant will be assessed. If approved, this percentage will be used to determine the number of points earned for this indicator.

Description of how performances will be later tested and assessed immediately after the application (later in the process/lifecycle)

There may be verification that the MPG calculation was submitted and that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion of the building.

MATERIALS | CIRCULAR INDICATORS

Theme: Materials **Type of indicator: Process**	**11. Material passport (MP)**
This indicator evaluates the extent to which the information needed to properly manage materials will be made available by the developer of a building/site, now and in the future.	
Relevance in the circular economy	In a circular economy, a material passport is essential to facilitate the future reuse and recovery of materials and to show the impact of procured materials, as well as the current value and status of materials and components.
Calculation or evidence for indicator	Qualitative assessment of the material passport and monitoring system: 1. Material passport with types of materials and quantities: 20 points or 100 (indicator 2, MBM) 2. Material passport with data on source and procurement: 20 points (indicator 8, DIM) 3. Material passport linked to BIM system with data on connections: 20 points (indicator 3, OVD) 4. Material passport linked to BIM system with data on optimal disassembly: 20 points (4, HM) 5. Material passport linked to BIM system with data on functional status of materials and components (needing replacement or otherwise): 20 points

Data

Necessary data per metric:	Material passport (total in tonnes per type) Final design	**Owner of data:**	Builder/developer

Phase of the lifecycle at which indicator can be calculated: **design phase**

Information for Tender Team

Specific objective (to be formulated in request for tender)

In a circular economy, a material passport is essential to facilitate the future reuse and recovery of materials and to show the impact of procured materials, as well as the current value and status of materials and components..

Description of minimum requirement (ground for exclusion)

With the design, the applicant must submit an Environmental Performance of Buildings (MPG) calculation, containing an estimate of the environmental costs of the development, expressed in euros per m² gross floor area (GFA) per year, based on the design and accompanying specifications and quantities. The calculation of the environmental performance must be produced by an expert and based on the current or most recent version of the National Environmental Database. Software is available from BREEAM and/or GPR Building to perform the calculations.

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

Not applicable

MATERIALS | CIRCULAR INDICATORS

QUALITATIVE SCORING

In addition to the MPG calculation, the applicant must submit an action plan /design for producing a material passport and handing it over on completion of the building.

The design or action plan must describe how at least the following aspects / elements will be translated in the material passport and how these aspects will be addressed during the design and construction process and during the use phase (including management and monitoring):

Materials, indicator 2.	Environmental impact of purchased materials (MBM)
Materials, indicator 3.	Design for disassembly (DfD), specification of connections/method of assembly/demountability
Materials, indicator 4.	Theoretical reusability of materials or elements at equivalent level of quality (HM)
Materials, indicator 8.	Sustainable procurement of materials: Certification of purchased renewable materials and metals (DIM)

The linking of these original data to a BIM system or monitoring and management system.

There will be a qualitative assessment of the action plan. Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

The evidence that has to be provided

The applicant must submit an Environmental Performance of Buildings (MPG) calculation (which is required when applying for an environmental permit), with a list of all the elements and materials used in the building (which is also input for the MPG calculation, see also point 2), together with an action plan showing how the material passport to be provided on completion will be written, handed over and managed, including the procedure for choosing design solutions and making material choices during the design and construction process and for creating and managing a digital BIM system.

Description of how the information/evidence provided will be tested and assessed on submission of the application (during selection procedure)

The municipality will perform a qualitiative assessment of the action plan for creating, handing over and managing the material passport, with the outcome expressed in a score.

Description of how performances will be tested and assessed after the application (later in the process/lifespan)

There may be verification that the MPG calculation was submitted and that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion of the building.

MATERIALS | CIRCULAR INDICATORS

Theme: Materials **Reduce** **Type of indicator: Product**	**12. Circular material score (CMS)**

This indicator is a combination of a number of previous scores designed to highlight mutual relationships and incorporate them correctly in the evaluation.

Relevance in the circular economy	Limiting the use of materials is a priority in a circular economy, but not if it leads to the use of the wrong types of materials (such as scarce, critical, or toxic materials). This indicator is designed to identify these interrelationships.
Calculation or evidence for indicator	For this indicator, we look at the material intensity, the use of scarce, critical and renewable materials in the design, and the use of secondary materials in the design. Finally, we consider the theoretical reusability of materials in the design. CM = total mass of secondary and renewable materials / total mass of materials used in the construction

Data

Necessary data per metric:	Material passport (total materials in tonnes per type per element) Replacement during functional lifespan Total number of residential units Expected functional lifespan per element in design	**Owner of data:**	Designer Builder/developer

Phase of the life cycle at which indicator can be calculated: **design phase**

Information for Tender Team

This is a combination of a number of a specific Materials indicators

MATERIALS | CIRCULAR INDICATORS

For the purposes of the tender, criteria/texts and assessment systems for the following indicators can be used:

Materials, indicator 2.	Environmental impact of purchased materials (MBM)
Materials, indicator 4.	Theoretical reusability of materials or components at equivalent level of quality (HM)
Materials indicator 5.	Use of secondary materials for construction (SM)
Materials indicator 9.	Use and capture of scarce and critical materials (KM)
Materials indicator 10.	Use of renewable materials (BBM)

If the circular material score is requested in the request for tender, the requirements of the criteria for the specific indicators should be combined into a "total package" and requested.

ENERGY | CIRCULAR INDICATORS

Theme: Energy — 1. Energy efficiency (EE)

Type of indicator: Product

This indicator evaluates the energy demand during the building's use phase. It encompasses the efficiency of the insulation, heating and building systems; user-related energy demand and self-generation are covered in indicators 5 and 7, respectively.

Relevance in the circular economy	Meeting the energy demand of a building or project uses up resources and scarce materials, even if renewable energy is uesd (wind turbines and solar panels also have to be built). It is therefore important to reduce energy demand over the entire functional lifespan.
Metric and formula	Energy demand = (EPC * GFA)/ number of persons living in the building

Data

Necessary data per metric:	EPC = energy performance coefficient (-solar energy production) (kWh/m^2/year)	**Owner of data:**	Contractor
Necessary data:	GFA = gross floor area (m^2)	**Owner of data**	Contractor

Phase of the lifecycle at which indicator can be calculated: **design phase**

Information for Tender Team

Specific objective (to be formulated in request for tender)

Meeting the energy demand of a building or project uses up resources and scarce materials, even if renewable energy is uesd (wind turbines and solar panels also have to be built). It is therefore important to reduce energy demand over the entire functional lifespan.

Description of minimum requirement (ground for exclusion)

The applicant must submit a calculation of the Energy Performance Coefficient (EPC) with the design, which can be used to calculate the building's energy performance on the basis of the design and associated specifications. The calculation must be made by an expert using a model based on either the NEN 5128 or the NEN 2916 standard. The print-out of the calculation must give the name of the software used, and must be accompanied by design drawings and specifications, an explanation of the EPC calculation and the necessary declarations / evidence underpinning the data.

Description of how points can be earned, up to the maxmimum score

QUANTITATIVE SCORING

The applicant must submit a calculation of the EPC (see minimum requirement). Points will be awarded for an EPC score lower than the reference value, in accordance with the table below.

The reference value for the Energy Performance Coefficient (EPC) is the standard according to the current version of the Building Decree. If the calculation shows that the EPC value for the development will be lower, it will be rated as follows:

EPC calculation below reference value: <= 20% below reference	0 points
EPC calculation below reference value: <= 40% below reference	25 points
EPC calculation below reference value: <= 60% below reference	50 points
EPC calculation below reference value: <= 80% below reference	75 points
EPC calculation below reference value: <= 100% below reference	100 points

QUALITATIVE SCORING
Not applicable for this indicator
The evidence that has to be provided
With the design, the applicant must submit a calculation of the Energy Performance Coefficient (EPC) showing the building's energy performance on the basis of the design and accompanying specifications. The calculation must be made by an expert using a model based on either standard NEN 5128 or standard NEN 2916. The print-out of the calculation must give the name of the software used, as well as design drawings and specifications, an explanation of the EPC calculation and the necessary declarations / evidence underpinning the data.
Description of how the information/evidence provided will be tested and assessed on submission of the application (during selection procedure)
The municipality will assess whether the requested analysis has been submitted and meets the prescribed requirements/criteria. The assessment will also determine whether the design corresponds with the conclusions in the analysis for the relevant elements.
Description of how performance will be tested and assessed after the application (later in the process/lifespan)
Calcualtion of the EPC score on the basis of the situation on completion. Confirmation that the building was constructed according to the basic principles and/or declaration/explanation of how the building was developed, and, in the case of non-conformities, how the final result was achieved.

ENERGY | CIRCULAR INDICATORS

Theme: Energy Type of indicator: Product	2. Embodied energy (IE)		
This indicator evaluates the energy demand ensuing from the choice and procurement of materials, in other words before completion and use of the building.			
Relevance in the circular economy	In addition to the energy consumption during the use phase, it is important to consider the energy embodied in the materials and element used in the building. This will promote energy reduction throughout the building's functional lifespan by encouraging the use of building materials with a small energy footprint and preventing possible shifts of energy consumption from the use phase to the procurement phase		
Calculation or evidence for indicator	Quantitative calculation of embodied energy: IE = embodied energy of materials * estimated frequency of replacement during functional lifespan		
Data			
Necessary data:	Embodied energy (MJ) of materials	**Owner of data:**	Suppliers

Phase of the lifecycle at which indicator can be calculated: **procurement phase**

This indicator is fleshed out under Materials 2 (energy performance calculation)

ENERGY | CIRCULAR INDICATORS

Theme: Energy Type of indicator: Product	3. Energy cascading (EC)
This indicator evaluates the application of the principles of energy cascading in the design of a building or an area. With energy cascading, available energy streams are reused as far as possible, and efforts are made to maintain the quality by optimally matching the temperature and form (light, electricity or heat) to the end use.	
Relevance in the circular economy	In a circular economy, the high-value use of available streams in order to prevent wastage or loss of quality is important, also in the case of energy streams where the focus is on high-value reuse of heat and available resources.
Calculation or evidence for indicator	Qualitative assessment of the application of the principles of energy cascading: 1. Reuse of residual heat from shower water to pre-heat water (15 points) 2. Use of daylight for natural lighting to reduce the lumen required in lighting plan by X% (15 points) 3. Use of daylight for natural heating (15 points) 4. Use of residual heat from outside the building (15 points) 5. Other, to be determined or suggested by the applicant (maximum 40 points)

ENERGY | CIRCULAR INDICATORS

Data

Necessary data:	Final design	Owner of data:	Designer

Phase of the life cycle at which indicator can be calculated: **design phase**

Information for Tender Team

Specific objective (to be formulated in request for tender)

In a circular economy, high-value use of available streams in order to prevent wastage or loss of quality is important, also in the case of energy streams where the focus is on high-value reuse of heat and available resources.

Description of minimum requirement (ground for exclusion)

With the design, the applicant must submit a calculation of the Energy Performance Coefficient (EPC) showing the building's energy performance on the basis of the design and accompanying specifications. The calculation must be made by an expert using a model based on either standard NEN 5128 or standard NEN 2916. The print-out of the calculation must give the name of the software used, as well as design drawings and specifications, an explanation of the EPC calculation and the necessary declarations / evidence underpinning the data.

Description of how points can be earned, with scores ascending to a maxmimum

QUANTITATIVE SCORING

Not applicable for this indicator

QUALITATIVE SCORING

The applicant must submit a calculation of the EPC (see minimum requirement and Energy 1, EE). The applicant should also specify any further measures that will be taken in relation to the use or reuse of available streams (energy cascading). The measures in the list may or may not have been included in the EPC calculation.

The following measures and any additional measures adopted by the applicant will be graded:

1. Reuse of residual heat from shower water to pre-heat water	15 points
2. Use of daylight for natural lighting to reduce the lumen required in lighting plan by X%	15 points
3. Use of daylight for natural heating	15 points
4. Use of residual heat from outside the building	15 points
5. Additional measures (suggested by applicant)	maximum 40 points

The evidence that has to be provided

With the design, the applicant must submit a calculation of the Energy Performance Coefficient (EPC) showing the building's energy performance on the basis of the design and accompanying specifications. The calculation must be made by an expert using a model based on either standard NEN 5128 or standard NEN 2916. The print-out of the calculation must give the name of the software used, as well as design drawings and specifications, an explanation of the EPC calculation and the necessary declarations / evidence underpinning the data. The EPC calculation must be accompanied by a separate list of (proposed) measures to be adopted in the context of "energy cascading". These can be measures that have been included in the EPC calculation or measures that are not normally included in the calculation.

Description of how the information/evidence provided will be tested and assessed on submission of the application (during selection procedure)

The municipality will assess whether the requested analysis has been provided and meets the prescribed requirements/criteria. The assessment will also determine whether the design corresponds with the conclusions in the analysis for the relevant elements. The proposed measures will also be assessed and scored, and there will also be verification that the proposed measures have been incorporated in the design.

Description of how performance will be tested and assessed after the application (later in the process/lifespan)

The proposed measures that have actually been implemented may be assessed on the basis of the later application for an environmental permit and the accompanying EPC calculation. For those measures that are not incuded in the EPC calculation, on completion the developer may be asked for a declaration confirming the measures that have been taken and explaining how they were implemented.

ENERGY | CIRCULAR INDICATORS

Theme: Energy **4. Renewable energy (DE)**

Type of indicator: Product

This indicator evaluates the percentage of the energy demand that is met with renewable energy.

ENERGY | CIRCULAR INDICATORS			
Relevance in the circular economy	In a circular economy, 100% of the energy comes from renewable sources, so striving to create a sustainable energy supply is an important objective. In that context, no distinction is made between *in situ* production and production outside the area's boundaries, although a local energy supply is rated more highly rated wherever possible.		
Metric and formula	Quantitative calculation of the percentage of the demand met by renewable energy: DE = annual energy demand / (annual production + procurement of renewable energy) * 100% (maximum is 100%)		
Data			
Necessary data:	Annual energy demand (energy efficiency indicator + estimated consumption by users)	**Owner of data:**	Designers
Necessary data:	Annual production of renewable energy	**Owner of data:**	Designers
Necessary data:	Annual procurement of renewable energy	**Owner of data:**	Developer (if choice is not left to residents)

Phase of the life cycle at which indicator can be calculated: **design phase**

Information for Tender Team

Specific objective (to be formulated in request for tender)

In a circular economy, high-value use of available streams is important to avoid wastage or loss of quality; in the case of energy streams the focus is on high-value reuse of heat and available resources.

Description of minimum requirement (ground for exclusion)

With the design, the applicant must submit a calculation of the Energy Performance Coefficient (EPC) showing the building's energy performance on the basis of the design and accompanying specifications. The calculation must be made by an expert using a model based on either standard NEN 5128 or standard NEN 2916. The print-out of the calculation must give the name of the software used, as well as design drawings and specifications, an explanation of the EPC calculation and the necessary declarations / evidence underpinning the data.

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

The applicant must submit a calculation of the Energy Performance Coefficient (EPC) (see minimum requirement and Energy 1, EE). The applicant must also submit an action plan for the use of renewable energy, including both the measures included in the EPC calculation (for example, PV panels) and measures that are not (for example, purchased renewable energy).

BREEAM-NL ENE 5 can be used as a reference for the aspect "renewable energy generation on or close to the site".

BREEAM ENE 5 explanatory note: Only (local) techniques for renewable energy generation are to be included in this credit, and not energy efficiency techniques. Energy efficiency techniques are already assessed in credit ENE 1. These also include some techniques for renewable energy generation in buildings that have an energy-saving effect (thereby reducing CO_2 emissions) within the building, such as the use of solar cells and total energy systems based on biomass, biogas and such like. The underlying concept in this credit ENE 5 is to separately assess techniques for renewable energy generation within the building or in its proximity for the building's benefit. This is because relatively little use is made of renewable energy techniques in the Netherlands. The credit is therefore intended to positively recognise the fact that the building contributes to the use of renewable energy within the built environment as such.

In the action plan the applicant must explain how and with what measures energy will be generated on or close to the site, and express it in terms of the CO_2 reduction that will be achieved with them. The action plan must also explain what the maximum (technical / physical) potential is for generating renewable energy on or in the proximity of the site. The larger the proportion of the maximum potential capacity actually used, the higher the score.

Maximum score: 75 points. Potential score: 0 to 100% of the maximum score, depending on the percentage of the maximum capacity that is used.

The additional 25 points that can be earned depend on the remaining energy demand (i.e., the energy demand according to the EPC calculation minus the renewable energy generated) and the extent to which renewable energy is procured to meet it.

Maximum score: 25 points Potential score: 0 to 100% of the maximum score, depending on the percentage of renewable energy purchased.

Total score = maximum 100 points (75 + 25 points)

QUALITATIVE SCORING

The applicant must submit a vision/action plan for the generation and use of renewable energy in the project, which should also specify and explain the quantities of (primary or electric) energy to be generated and the potential CO_2 reduction. Innovative and efficient solutions and optimal use of the physical, technical and functional possibilities on and around the site will also be evaluated.

There will be a qualitative assessment of the vision/action plan. Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

ENERGY | CIRCULAR INDICATORS
Evidence that has to be provided
With the design, the applicant must submit a calculation of the Energy Performance Coefficient (EPC) showing the building's energy performance on the basis of the design and accompanying specifications. The calculation must be made by an expert using a model based on either standard NEN 5128 or standard NEN 2916. The print-out of the calculation must give the name of the software used. The applicant must also submit an action plan containing the measures to be taken to generate renewable eregy on or close to the site, as well as a statement regarding the procurement of renewable energy. Both must include a calculation and explanation of the CO_2 reduction that will be achieved with the measures.
Description of how the information/evidence provided will be tested and assessed on submission of the application (during selection procedure)
The municipality will assess whether the requested analysis has been provided and meets the prescribed requirements/criteria. The assessment will also determine whether the design corresponds with the conclusions in the analysis for the relevant elements. The proposed measures and the projected results (CO2 reduction) will also be assessed and scored, and there will also be verification that the proposed measures have been incorporated in the design.
Description of how performance will be tested and assessed after the application (later in the process/lifespan)
The proposed measures that have actually been implemented may be assessed on the basis of the later application for an environmental permit and the accompanying EPC calculation. For those measures that are not included in the EPC calculation, on completion the developer may be asked for a declaration confirming the measures that have been taken and explaining how they were implemented.

ENERGY | CIRCULAR INDICATORS			
Theme: Energy Type of indicator: Product	5. Energy matching (EM)		
This indicator evaluates the application and smart use of local sources of renewable energy and possible storage and change of use due to the resulting independence from the electricity network expressed in time rather than volume of energy.			
Relevance in the circular economy	Smart matching of energy demand to local generation of renewable energy in the space and time dimension can (1) guarantee maximum use of renewable generation in relation to use of the "grey" energy mix from the network; (2) create a resilient energy supply that is less vulnerable to power failures; and 3) reduce investments and losses in energy distribution and systems. These effects will contribute to increasing the share of renewable energy, creating resilient systems, and reducing the impact from material and energy use, respectively.		
Calculation or evidence for indicator	A quantitative calculation of the percentage of the hours in the year that the building or area can meet its own energy demand with locally generated renewable energy. EM = number of hours in which energy demand can be met with own production and storage / 8,760 (hours in the year) x 100%		
Data			
Necessary data:	Estimated energy consumption profile	**Owner of data:**	Designer
Necessary data:	Estimate of energy production profile and available flexibility of storage and change of use.	**Owner of data**	Designer
Phase of the lifecycle at which indicator can be calculated: **design phase**			
Information for Tender Team			
Description of specific objective (to be formulated in request for tender)			
Smart matching of energy demand to local generation of renewable energy in the space and time dimension can (1) guarantee maximum use of renewable generation in relation to use of the "grey" energy mix from the network; (2) create a resilient energy supply that is less vulnerable to power failures; and 3) reduce investments and losses in energy distribution and systems. These effects will contribute to increasing the share of renewable energy, creating resilient systems, and reducing the impact from material and energy use, respectively.			
Description of minimum requirement (ground for exclusion)			
With the design, the applicant must submit a calculation of the Energy Performance Coefficient (EPC) showing the building's energy performance on the basis of the design and accompanying specifications. The calculation must be made by an expert using a model based on either standard NEN 5128 or standard NEN 2916. The print-out of the calculation must give the name of the software used, as well as design drawings and specifications, an explanation of the EPC calculation and the necessary declarations / evidence underpinning the data.			
Description of how points can be earned, up to the maximum score			
QUANTITATIVE SCORING			

ENERGY | CIRCULAR INDICATORS

The applicant must submit an EPC calculation (see minimum requirement and Energy 1, EE). In addition, the applicant must submit a calculation, linked to the data from the EPC calculation and for the use of the building, which incorporates the assumptions for the distribution of energy consumption in the building during the periods referred to below.

- energy use during the day (the pattern in the average use of electricity, heat and hot water average over a period of 24 hours), *for the time being no distinction is made between weekdays and weekends.*
- the above assumptions are linked to or translated into averages in the twelve months of the year, related to average climatological conditions during the year (select reference year).
- this produces a matrix showing how much energy is used on average during each hour of the 24 hour period in each month.

The applicant must also submit a projection of the amount of the energy that will be generated on or close to the site, also with assumptions/calculations of the amount of energy that will be generated during the periods referred to below.

- energy generation during a 24-hour period (the pattern in the average generation of energy over a 24-hour period), according to the month of the year.
- the above assumptions are linked to or translated into averages in the twelve months of the year, related to average climatological conditions and data for the site (such as data for wind and the number of hours of sunlight) during the year.

Submitting the above calculations and analyses	25 points
Making energy-matching calculations (analysis of coincidence in time, peaks and dips)	25 points
Analysing the calculations and adopting meaure for improvements	maximum 50 points

the closer the applicant comes to maximizing the use of site-specific possibilites for energy matching, the higher the score.

QUALITATIVE SCORING

The applicant must submit a vision/action plan for the generation and use of renewable energy in the project. The plan should preferably also specify and explain the quantities of (primary or electric) energy to be generated and the potential CO_2 reduction. On the basis of these data, the applicant will present its vision of energy matching, preferably accompanied by examples and possible measures geared to the location of the development.

There will be a qualitative assessment of the vision / action plan. Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

Evidence that has to be provided

With the design, the applicant must submit a calculation of the EPC showing the building's energy performance on the basis of the design and accompanying specifications. The calculation must be made by an expert using a model based on either standard NEN 5128 or standard NEN 2916. The print-out of the calculation must give the name of the software used. The applicant must also submit an action plan containing the measures to be taken to generate renewable eregy on or close to the site, as well as a statement regarding the procurement of renewable energy. Both must include a calculation and explanation of the CO_2 reduction that will be achieved with the measures. The applicant must also submit an action plan, setting out the measures to be taken to generate renewable energy on or close to the site and possible measures to improve the match between energy supply and demand, preferably including estimates of how much less use will be made of public energy grids to receive or supply energy at times when there is no simultaneous use and generation of energy.

Description of how the information/evidence provided will be tested and assessed on submission of the application (during selection procedure)

The municipality will assess whether the requested analysis has been provided and meets the prescribed requirements/criteria. The assessment will also determine whether the design corresponds with the conclusions in the analysis for the relevant elements. The proposed measures and the projected results (less use and return of energy) will also be assessed and scored, and there will also be verification that the proposed measures have been incorporated in the design.

Description of how performance will be tested and assessed later after the application (later in the process/lifecycle)

The proposed measures that have actually been implemented may be assessed on the basis of the later application for an environmental permit and the accompanying EPC calculation. For those measures that are not included in the EPC calculation, on completion the developer may be asked for a declaration confirming the measures that have been taken and explaining how they were implemented.

ENERGY | CIRCULAR INDICATORS

Theme: Energy Type of indicator: Process	6. Performance feedback (PF)
This indicator evaluates the existence of applications to monitor the use of the energy systems and to provide feedback to the residents or users of the building	
Relevance in the circular economy	Providing feedback on energy performance can cause users to change their behaviour and keep building managers (or system suppliers) informed about current efficiency and potential savings from switching to a new system. This helps to lower energy demand and hence a reduction of the associated impacts.

ENERGY | CIRCULAR INDICATORS			
Calculation or evidence for indicator	Qualitative assessment of the use of energy montoring and feedback applications: 1. Existence of applications to measure energy consumption and production at X intervals and present them to the users of the building (33 points). 2. Existence of applications to measure the performance of energy systems and applications (33 points). 3. Existence of applications to measure energy consumption and production at X intervals and present them to the network manager (33 points).		
Data			
Necessary data:	Monitoring and feedback applications	**Owner of data:**	designer
Phase of the lifecycle at which indicator can be calculated: **design phase**			

Information for Tender Team

Description of specific objective (to be formulated in request for tender)

Providing feedback on energy performance can cause users to change their behaviour and keep building managers (or system suppliers) informed about current efficiency and potential savings from switching to a new system. This helps to lower energy demand and hence a reduction of the associated impacts.

Description of minimum requirement (ground for exclusion)

Not applicable

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

Reference: BREEAM-NL New Construction and Disassembly, credit ENE 2b (Sub-metering of energy uses, residential)

Use of energy meters — 33 points

The electricity meter or meters of primary energy sources (e.g., (bio)gas, (bio)oil, etc.) are connected to an energy monitoring system with a display that can show current and historical information on the energy consumption of the house.

The display must show the following information:

- Current energy consumption in kW or watts.
- Current energy consumption in kWh (for the day and the last hour).
- Current estimated emissions (gram or kg CO_2).
- Current energy prices.
- Current energy costs (for the day and the last hour).
- Visual presentation of data (numerical or otherwise) so that users can easily identify low and high energy consumption.

Additional use/application — 33 points

The electricity meter or meters of primary energy sources (e.g., (bio)gas, (bio)oil, etc.) are connected to an energy monitoring system and can display historical information of energy consumption of the dwelling.

The disply must display the following information:

- Historical data on energy consumption so that consumption can be compared with earlier periods and analyses can be produced as a basis for proposals and measures for improvements.
- The historical data must be displayed for a day, a week, a month and the invoicing period. The data must be saved for at least two years on the device or available for consultation online.

Notification / registration — 33 points

In addition to the above, data are reported to the network manager.

QUALITATIVE SCORING

The applicant must submit a vision/action plan explaining how the energy performance of the building will be measured, monitored and registered. The plan will be regarded as adequate if the measures will provide a better insight into the energy consumption for residents and building managers, insight into the performance of the building and installations, and possibilities to monitor and improve the performance on the basis of the feedback, and if necessary take measures geared to the needs of residents or managers and the life cycle of installations and occasions when they need to be replaced.

There will be a qualitative assessment of the vision/action plan. Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

The evidence that has to be provided

ENERGY | CIRCULAR INDICATORS

The applicant must submit an action plan in which the system and the energy metering equipment are explained. The action plan must clearly explain the types of energy that are used, related to the energy concept for the development (heat, cold, electricity, gas, other). The energy concept and design of the development it relates to must also be explained by means of design drawings, diagrams and/or specifications.

Description of how the information/evidence provided will be tested and assessed on submission of the application (during selection procedure)

The municipality will assess whether the requested analysis has been submitted and meets the specified requirements/criteria. It will also assess whether the proposed applications and facilities correspond with the energy concept and the design of the development.

Description of how performance will be tested and assessed after the application (later in the process/lifespan)

At the time of the application for an environmental permit, a declaration and explanation of the measures in the design that have been carried out at that time in relation to the feedback on the performance of the building and the installations may be requested.

ENERGY | CIRCULAR INDICATORS

Theme: Energy Type of indicator: Process	7. Performance contracting for energy systems (PC)

This indicator evaluates the existence of performance contracting with suppliers of energy systems or applications.

Relevance in the circular economy	There should be a constant focus on optimizing energy systems and applications, since rapid efficiency gains and the lengthy lifespan of these developments can yield energy savings. Provided the use of materials for these systems is circular, with regular updates energy systems will have a smaller impact over the functional lifespan of a building. Performance contracting for these systems and applications lays the incentive to improve the performance of these systems with the supplier. It can therefore be assumed that the supplier will ensure that the systems operate highly efficiently.
Calculation or evidence for indicator	Qualitative assessment of performance contracts: 1. Existence of performance contracts for HVAC systems (50 points) 2. Existence of performance contracts for lighting systems (30 points) 3. Existence of performance contracts for other energy applications (refrigerators, dishwashers, freezers, washing machines, etc.) (20 points)

Data

Necessary data:	Existence of contracts	**Owner of data:**	Contractors and suppliers

Phase of the life cycle at which indicator can be calculated: **contracting phase**
Phase of the life cycle at which indicator can be calculated: **design phase**

Information for Tender Team

Specific objective (to be formulated in request for tender)

There should be a constant focus on optimizing energy systems and applications since rapid efficiency gains and the lengthy lifespan of these developments can yield energy savings. Provided the use of materials for these systems is circular, with regular updates energy systems have a smaller impact over the lifetime of a building. Performance contracting for these systems and applications lays the incentive to improve the performance of these systems with the supplier. It can therefore be assumed that the supplier will ensure that the systems operate highly efficiently.

Description of minimal requirement (ground for exclusion)

Not applicable

Description of how points can be earned, with ascending score to the maximum score

QUANTITATIVE SCORING

Not applicable.

QUALITATIVE SCORING

ENERGY | CIRCULAR INDICATORS

The applicant must submit an action plan for selecting, contracting with and monitoring the parties implementing, and later managing and maintaining, the installations and energy systems in the building. Specific attention should be devoted to monitoring and improving the performance of the energy systems and reducing the impact of energy consumption throughout the functional lifespan of a building. The action plan must address the question of how performance contracting with fitters and suppliers will be used to efficiently and effectively guarantee and improve performance, at least in relation to HVAC and lighting systems.

There will be a qualitative assessment of the action plan. Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

Evidence that has to be provided

The applicant must submit an action plan for selecting, contracting and monitoring the parties responsible for installing, and later managing and maintaining, the building's installations and energy systems, with particular emphasis in performance contracting for monitoring and improving the energy performance of the energy systems.

Description of how this information/evidence will be tested and assessed on submission of the application (during selection procedure)

The municipality will perform a qualitative assessment of the action plan, with the outcome expressed in a score.

Description of how performances will be tested and assessed after the application (later in the process/lifespan)

During and/or on completion of construction, a list of the parties responsible for the construction and later management of the building may be checked, including the associated contractual agreements, tasks, powers and responsibilities.

WATER | CIRCULAR INDICATORS

Theme: Water Type of indicator: Process	1. Water consumption(WV)		
This indicator evaluates the estimated total annual water demand on the basis of the design choices that are made			
Relevance in the circular economy	In a circular economy, the objective is to drastically reduce the demand for water by implementing best practices and using the most efficient technologies throughout the functional lifespan, such as water-saving or water-recycling appliances.		
Calculation or evidence for indicator	Quantitative calculation of annual water consumption: WV = annual water consumption of the building / number of persons residing in the building.		
Data			
Necessary data per metric:	Estimated annual water consumption of building	**Owner of data:**	Designer

Phase of the lifecycle at which indicator can be calculated: **design phase**

Information for Tender Team

Specific objective (to be formulated in request for tender)

In a circular economy, the objective is to drastically reduce the demand for water by implementing best practices and using the most efficient technologies throughout the functional lifespan, such as water-saving or water-recycling appliances.

Description of minimum requirement (ground for exclusion)

No minimum requirement.

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

WATER | CIRCULAR INDICATORS

The applicant must submit the following information (reference: BREEAM-NL-2014, WAT 1, Water consumption)

Toilets

All toilets are fitted with a flush selector or flush circuit breaker. The maximum flush volume is 6 liters. 20 points

If there are toilets with no flush selector or flush breaker, the maximum flush volume is 4 liters, in which case measures are also taken to safeguard/guarantee the flow.

Taps

All taps, with the exception of those in kitchens, at cleaning sinks or outdoor taps, have an excess flow valve, set at a maximum of 6 liters/minute at a pressure of 3 bar and are one or a combination of the following types: 20 points

- taps with a timed water supply;
- taps with an electronic sensor;
- taps with a programmable low outflow rate
- taps with a spray head.

Showers

All shower heads have, according to the specifications, a measured maximum flow rate of 9 liters per minute or less at a pressure of 3 bar and an assumed water temperature of 37 C. 20 points

Other appliances

The applicant may adopt other technical measures that will enable additional reuse / recycling of rainwater and grey water, for washing machines, dishwashers, etc. and will result in a further reduction of water consumption. 20 points

Calculation of water saving

The applicant can substantiate the effect of these and any other water-saving measures with a calculation showing the normal water consumption of an average household and the reduction that will be achieved by implementing the measures.

This calculation is mainly intended to provide insight into the potential environmental benefits of implementing the measures. 20 points

SCORE: **WV = maximum 100 points**

QUALITATIVE SCORING

The applicant must submit a plan for reducing water consumption as far as possible in the development. The plan should preferably be translated into measures that can be taken at location, building or user level. As many of the proposed measures as possible must be implemented in fleshing out the plan, when the performance (in terms of saving water) should also be measured and demonstrated.

There will be a qualitative assessment of the plan.

Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

Evidence that has to be provided

The applicant must provide a list of proposed water-saving measures, together with relevant specifications and drawings.

Description of how the information/evidence provided will be tested and assessed on submission of the application (during selection procedure)

The municipality will determine whether the list and supporting documents have been submitted and meet the specified requirements/ criteria. On the basis of those documents, it will also determine the extent to which the criteria for water-saving measures are met. The score for this indicator will be determined on the basis of that assessment.

Description of how performance will be tested and assessed after the application (later in the process/lifecycle

There may be be an assessment of which measures to reduce water consumption have been implemented and the results they have yielded when the application for an environmental permit is submitted, and possibly on completion of the building.

ENERGY | CIRCULAR INDICATORS

Theme: Energy **Type of indicator: Process**	**2. Cascading water streams: recovery of gray water and rainwater (CW)**
This indicator evaluates the matching of rainwater and gray water storage with possible practical end uses.	
Relevance in the circular economy	In a circular economy, optimizing the water system for uses of the necessary quality is essential (e.g., matching the available water source or residual stream with the end use). In other words, water that is suitable for drinking should only be used as drinking water rather than for flushing the toilet or for cleaning. Rainwater and gray water have their own ideal end uses.
Calculation or evidence for indicator	Quantitative calculation of annual practical reuse of rainwater and gray water: CW = (quantity of rainwater + gray water used in toilets + quantity of rainwater + gray water used in washing machines and dishwashers + quantity of rainwater and gray water used for indoor plants) / total annual water demand for these applications.
Data	

ENERGY | CIRCULAR INDICATORS			
Necessary data per metric:	Projected quantity of water reused for various functions	**Owner of data:**	Designer

Phase of the life cycle at which indicator can be calculated: **design phase**

Information for Tender Team

Specific objective (to be formulated in request for tender)

In a circular economy, optimizing the water system for uses of the necessary quality is essential (e.g., matching the available water source or residual stream with the end use). In other words, water that is suitable for drinking should only be used as drinking water rather than for flushing the toilet or for cleaning. Rainwater and gray water have their own ideal end uses.

Description of minimum requirement (ground for exclusion)

No minimum requirement.

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

The applicant must provide the following information (possible references include: BREEAM-NL-2014, WAT 5, Water recycling and WAT 6, Irrigation systems)

The use of gray water and rainwater to flush toilets (BREEAM WAT 5)

If a rainwater tank is installed and the tank's capacity is at least 50% of the total projected quantity of rainwater run-off from the roof during the 'defined period of collection', — 40 points

OR

the quantity of rainwater run-off from the roof that is needed for the total flush demand during the 'defined period of collection'.

Reducing the use of drinking water for landscaping (BREEAM WAT 6)

Where the specified irrigation method for internal and external landscaping is equal to one of the following methods: 30 points

a. Moisture Sensor-controlled drip irrigation under the surface. The control of the irrigation must be divided into zones so that different groups of planting can be irrigated variably;
b. reuse of rainwater or gray water;
c. external landscaping (planting) which is fully dependent on local rainfall, in every season of the year;
d. specified plants consisting entirely of species that grow well in hot and dry conditions.

The use of rainwater and gray water: other uses and appliances

The applicant may adopt other technical measures that will enable additional reuse / recycling of rainwater and grey water, for washing machines, dishwashers, etc., and will result in a further reduction of water consumption. — 30 points

SCORE: **CW = maximum 100 points**

QUALITATIVE SCORING

The applicant must submit a plan for reducing water consumption as far as possible in the development. The plan should preferably be translated into measures that can be taken at location, building or user level. As many of the proposed measures as possible must be implemented in fleshing out the plan, when the performance (in terms of saving water) should also be measured and demonstrated.

There will be a qualitative assessment of the plan.

Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

Evidence that has to be provided

The applicant must provide a list of proposed water-saving measures, together with relevant specifications and drawings.

Description of how the information/evidence provided will be tested and assessed onj submission of the application (during selection procedure)

The municipality will determine whether the list and supporting documents have been submitted and meet the specified requirements/ criteria. On the basis of those documents, it will also determine the extent to which the criteria for reuse/recycling of rainwater and gray water are met. The score for this indicator will be determined on the basis of that assessment.

Description of how performance will be tested and assessed after the application (later in the process/lifespan)

There may be an assessment of which measures to reduce water consumption have been implemented and the results they have yielded when the application for an environmental permit is submitted, and possibly on completion of the building.

WATER | CIRCULAR INDICATORS			
Theme: Energy **Type of indicator: Product**	**3. Recovering nutrients from waste water (NH)**		
This indicator evaluates the local recovery rate of nutrients (nitrogen (N) and phosphorus (P)) from waste water relative to the nutrient recovery performance of the local water board.			
Relevance in the circular economy	Separating waste water by type should be used wherever possible to optimize the recovery of resources and nutrients. The process must ensure that all impurities (and valuable raw materials) introduced into the water cycle by humans are filtered out before the water is returned to nature. In a circular economy, it is important for the natural nutrient cycle to be safeguarded by recovering the nutrients and reusing them, for example in food production.		
Calculation or evidence for indicator	Quantitative calculation of the annual recovery of nutrients from waste water: NH = ((N & P recovery / N & P present in waste water streams) - N & P recovery by water board) / (1.0 - N & P recovery by water board).		
Data			
Necessary data per metric:	Nutrient (N and P) recovery and reuse by water board (0.0 - 1.0)	**Owner of data:**	Water board
Necessary data per metric:	Estimate of annual nutrient (N and P) production (kg)	**Owner of data:**	Water board
Necessary data per metric:	Estimate of annual nutrient (N and P) recovery (kg)	**Owner of data:**	Designer/ supplier of systems
Phase of the lifecycle at which indicator can be calculated: **design phase**			

For the time being we assume that this recovery will occur via the public sewage treatment plant.

WATER | CIRCULAR INDICATORS			
Theme: Energy **Type of indicator: Process**	**4. Monitoring and feedback for water management systems (MFW)**		
This indicator evaluates the existence of monitoring and feedback systems for the water management systems, water consumption, storage and collection, and rainwater and used water run-off.			
Relevance in the circular economy	A good management system reduces the (peak) run-off of water and nutrients into the water and minimizes the impact on the water during the functional lifespan. In a circular economy, it is particularly important to have good monitoring and feedback systems to measure performance and provide feedback to users and water boards.		
Calculation or evidence for indicator	Qualitative assessment of the use of water monitoring and feedback applications: 1. Existence of applications that measure water consumption and run-off at X intervals and displays the results to users of the building (33 points). 2. Existence of applications that measure the performance of the cascading and nutrient-recovery systems applications and uses and displays the results to the user (33 points). 3. Existence of applications that provide feedback on the measured data to the water board (33 points). When there is no cascading or nutrient management system, there are 50 points rather than 33 points for criteria 1 and 3.		
Data			
Necessary data:	Presence of monitoring and feedback systems	**Owner of data:**	Developer/builder
Phase of the lifecycle at which indicator can be calculated: **design phase**			
Information for Tender Team			
Specific objective (to be formulated in request for tender)			
A good management system reduces the (peak) run-off of water and nutrients into the water and minimizes the impact on the water during the functional lifespan. In a circular economy, it is particularly important to have good monitoring and feedback systems to measure performance and provide feedback to users and water boards.			
Description of minimal requirement (ground for exclusion)			

WATER | CIRCULAR INDICATORS

No minimum requirement.

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

The applicant must provide the following information (possible references include BREEAM-NL-2014, WAT 2 Water meter)

Ensure that water consumption can be monitored and managed (BREEAM WAT 2)

The specification of a water meter on the mains water supply to each building, including instances where water is supplied via a borehole or other private source or through the use of water from a gray water or rainwater system.	50 points
The applicant must submit a plan for metering the entire water consumption in the building, underpinning the choices made for the number, position and type of main and sub meters. The water meters must be fitted with a pulse output signal linked to a BMS. The system must be fully programmable to identify a particular volume of water at a specific time of day. It must also be fitted with an alarm that hich will be activated when the volume of the flow measured by the water meters is higher than the maximum volume programmed for a particular time period.	
A higher score is awarded for this indicator if this information can be forwarded directly to the water company.	50 points
SCORE: **CW = maximum 100 points**	

QUALITATIVE SCORING

The applicant must submit a plan for using the data on drinking water consumption in the development to monitor, manage and where possible reduce consumption. The plan should preferably be translated into measures that can be taken at location, building or user level. As many of the proposed measures as possible must be implemented in fleshing out the plan, when the performance (in terms of saving water) should also be measured and demonstrated.

There will be a qualitative assessment of the plan.

Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

Evidence that has to be provided

The applicant must provide a list of measures to be taken to monitor consumption of drinking water and of source water and/or the reuse of rainwater and gray water accompanied, if necessary and/or useful, by design drawings and specifications. The system for forwarding data and providing feedback on performance must also be explained.

Description of how the information/evidence provided will be tested and assessed on submission of the application (during selection procedure)

The municipality will determine whether the list and supporting documents have been submitted and meet the specified requirements/criteria. On the basis of those documents, it will also determine the extent to which the criteria for a monitoring and feedback system for water management are met. The score for this indicator will be determined on the basis of that assessment.

Description of how performances will be later tested and assessed immediately after the application (later in the process/lifecycle)

There may be an assessment of which measures to reduce water consumption have been implemented and the results they have yielded when the application for an environmental permit is submitted, and possibly on completion.

WATER | CIRCULAR INDICATORS

Theme: Energy **Type of indicator: Product**	**5. Rain-proof design (RBO)**
This indicator evaluates the inclusion of rain-proofing measures in the design of the building.	
Relevance in the circular economy	Regions with heavy rainfall are vulnerable to flooding, which can be prevented with a "rain-proof" design that reduces the strain on the building and local rainwater management systems.
Calculation or evidence for indicator	Qualitative assessment of measures for a rain-proof design: 1. Raised construction 2. Thresholds or elevated floor 3. Pump with check valve 4. Design of a water-resistant basements 5. Make indoor utilities rain-proof 6. Rain-proof construction and choice of materials 7. Sealable buildings 8. Temporary flood defences.

WATER | CIRCULAR INDICATORS

Data

Necessary data per metric:	Drawings showing rain-proof measures in building	**Owner of data:**	Developer/designer

Phase of the lifecycle at which indicator can be calculated: **design phase**

Information for Tender Team

Specific objective (to be formulated in request for tender)

Regions with heavy rainfall are vulnerable to flooding, whch can be prevented with a "rain-proof" design that reduces the strain on the building and local rainwater management systems.

Description of minimal requirement (ground for exclusion)

No minimum requirement

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

Not applicable

QUALITATIVE SCORING

The applicant can adopt measures in the design that could mitigate or prevent future problems resulting from excessive rainfall.

The applicant must submit an action plan with a description of the proposed measures, together with the design drawings and specifications which also show these measures.

A non-exhaustive list of measures that could be implemented (at the discretion of the applicant) are (50% of the score):

- Raised construction
- Threshold or elevated floor
- Pump with check valve
- Design water-resistant basements
- Make indoor utilities rain-proof
- Rain-proof construction and choice of materials
- Sealable buildings
- Temporary flood defences.

Additional measures could be implemented to prevent, reduce or delay rainwater run-off from the building and the site to public sewers and watercourses. The applicant must specify any measures adopted for this purpose in the action plan.

Possible measures (at the discretion of the applicant, list is not exhaustive) are (50% of the score):

- Green roofs and/or walls
- Sustainable water-storage measures that slow the peak rate of run-off from the building/site to watercourses (reference BREEAM-NL POL 6 Surface water run-off).
- Sustainable infiltration measures that slow the peak rate of run-off from the building/site to watecourses (reference BREEAM-NL POL 6 Surface water run-off).

The total score for this indicator is arrived at by adding the scores for the two above sub-indicators.

The measures proposed for each sub-indicator in the action plan will be assessed. The more measures that are implemented, the higher the score.

There are 10 points to be earned for each indicator, with a maximum total of 20 points.

SCORE = sum of the two sub-indicators x 5 =..... (maximum 100 points)

The evidence that has to be provided

The applicant must submit an action plan describing the rain-proofing measures that will be taken. The action plan must describe/summarize the measures that are incorporated in the design of the building and the site. The applicant must provide underpinning of the measures with design drawings and specifications.

Description of how the information/evidence provided will be tested and assessed on submission of the application (during selection procedure)

There will be a qualitative assessment of the action plan and the supporting drawings and specifications. Scores will be given for the two sub-indicators according to the degree to which the assessor feels they comply with the principles of rain-proof buildings.

Description of how performance will be tested and assessed after the application (later in the process/lifespan)

WATER | CIRCULAR INDICATORS

There may be an assessment of which measures to reduce water consumption have been implemented and the results they have yielded when the application for an environmental permit is submitted, and possibly on completion.

ECOSYSTEMS/BIODIVERSITY | CIRCULAR INDICATORS

Theme: Ecosystems and Biodiversity **Type of indicator: Product**	**1. Embodied ecosystem impact (IEE)**		
This indicator evaluates the impact of design and procurement choices on global ecosystems.			
Relevance in the circular economy	In addition to the impact on the local ecosystem during the use phase, it is also important to consider the ecosystem impact embodied in the building's materials and elements. That impact is usually global and must therefore also be considered in addition to the local impact. Factors to be considered include climate change (GWP100), depletion of the ozone layer, photochemical oxidant forming, acidification, eutrophication, human toxicity, freshwater aquatic ecotoxicity, marine aquatic ecotoxicity and terrestrial ecotoxicity.		
Metric and formula	Quantitative calculation of embodied ecosystem impact: IE = embodied ecosystem impact of materials * estimated replacement frequency during functional lifespan.		
Data			
Necessary data:	Embodied ecosystem impact of materials	**Owner of data:**	Designer or purchaser, download from database (such as Simapro)
Necessary data:	Estimated replacement frequency during functional lifespan	**Owner of data:**	Designer

Phase of the life cycle at which indicator can be calculated: **design phase** (definitive in procurement phase)

This indicator is fleshed out under Materials 2 (environmental performance calculation)

ECOSYSTEMS/BIODIVERSITY | CIRCULAR INDICATORS

Theme: Ecosystems and Biodiversity **Type of indicator: Product**	**2. Ecosystem services (ED)**		
This indicator evaluates the value of ecosystem services in achieving social and environmental objectives and the interests the municipality is pursuing for the built environment, such as rainwater buffering, particulate matter and CO_2 capture, urban heat island reduction, etc.			
Relevance in the circular economy	Structural enhancement of biodiversity is an important objective in a circular economy. Symbiotic cooperation between the built environment and elements of the ecosystem contributes to this. Quantifying the value of these ecosystem elements for the built environment can highlight their value and promote their application.		
Metric and formula	Quantitative calculation of the value of existing planting in terms of CO_2 reduction, reduction of particulate matter and rainwater buffering using weighted conversion factors: ED = planted area* CO_2 reduction * monetary value of CO_2 + planted area * particulate matter reduction * monetary value of particulate matter + planted area * rainwater buffering * monetary value of water buffering.		
Data			
Necessary data:	Planted area	**Owner data:**	Designer
Necessary data:	Conversion factors	**Owner data:**	http://www.itreetools.org/resources/manuals.php

Phase of the lifecycle at which indicator can be calculated: **design phase**

Information for Tender Team
Description of specific objective (to be formulated in request for tender)

Structural enhancement of biodiversity is an important objective in a circular economy. Symbiotic cooperation between the built environment and elements of the ecosystem contributes to this. Quantifying the value of these ecosystem elements for the built environment can highlight their value and promote their application.

ECOSYSTEMS/BIODIVERSITY | CIRCULAR INDICATORS

Description of minimum requirement (ground for exclusion)

No minimum requirement

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

The applicant must submit an ecological plan with the design in which the following subjects are covered on the basis of the original situation at the stite and the planned development (Reference: BREEAM NL 2014 LE3 and LE4). See also ECO 3 BLD)

- What plants are planned in, on or around the building?
- Further specification of the species and number of plants and arguments for the choices made.
- Quantitative calculations for the following three aspects for the number and species of plants: CO_2 capture/reduction, particulate matter capture/reduction and rainwater buffering (quantity of CO_2; quantity of particular matter and volume of water).

CO_2 reduction	calculation of current presence?	outcome in relation to benchmark? Or in relation to other applicants?
Particulate matter reduction	calculation of current presence?	outcome in relation to benchmark? Or in relation to other applicants?
Rainwater buffering	calculation of current presence?	outcome in relation to benchmark? Or in relation to other applicants?

Maximum score: 100 points

QUALITATIVE SCORING

With the design, the applicant must submit an ecological report showing what ecological measures will be taken to protect plants and animals in or on the building and on the site on the basis of the original situation at the stite and the planned development (Reference: BREEAM-NL 2014, LE3 and LE4). See also ECO 3, BLD).

There will be a qualitative assessment of the plan. Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

The evidence that has to be provided

The applicant must submit an ecological report and demonstrate that it was written by an expert. The applicant must also demonstrate with references or design drawings and descriptions that the measures proposed by the ecologist are incoporrated in the design.

Description of how the information/evidence supplied will be tested and assessed on submission of the application (during selection procedure)

The municipality will determine whether the list and supporting documents have been submitted and meet the specified requirements/ criteria and whether the relevant elements of the design correspond with the measures proposed in the ecological report.

Description of how performances will be and assessed after the application (later in the process/lifespan)

There may be verification that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion.

ECOSYSTEMS/BIODIVERSITY | CIRCULAR INDICATORS

Theme: Ecosystems and Biodiversity **Type of indicator: Process**	**3. Enhancing local biodiversity (BLD)**
This indicator evaluates the measures that have been taken to enhance local biodiversity.	
Relevance I n the circular economy	Enhancing biodiversity is important in a circular economy, also on a local scale in the built environment. By integrating abiotic structures and flora and fauna in buildings and areas in the design phase, and where possible connecting them to regional ecological structures, habitats can be created for local and migrating species, which enhances biodiversity.

ECOSYSTEMS/BIODIVERSITY | CIRCULAR INDICATORS

Metric and formula	Qualitative assessment of the use of habitat elements and measures to enhance biodiversity: 1. Use of biotic or abiotic habitat elements that support a diverse range of species of significant value, recognized by an ecologist (40 points). 2. Support of rare species (the Red list or the Dutch Flora and Fauna Act) through the creation of habitats or support of migration routes, recogniszd by an ecologist (40 points). 3. Existence of a plan for management during the use phase (30 points).

Data

Necessary data:	Approval of habitat plan	**Owner of data:**	Recognised ecologist
Necessary data:	Management plan	**Owner of data:**	Contractor

Phase of the life cycle at which indicator can be calculated: **design phase (1 and 2) and contracting phase (3)**

Information for Tender Team

Specific objective (to be formulated in request for tender)

Enhancing biodiversity is important in a circular economy, also on a local scale in the built environment. By integrating abiotic structures and flora and fauna in buildings and areas in the design phase, and where possible connecting them to regional ecological structures, habitats can be created for local and migrating species, which enhances biodiversity.

Description of minimum requirement (ground for exclusion)

No minimum requirement

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

Not applicable

QUALITATIVE SCORING

With the design, the applicant must submit an ecological report in which the following subjects are covered on the basis of the original situation at the stite and the planned development (Reference: BREEAM NL 2014 LE3 and LE4).

- Ecological report describing and analysing the current situation in and around the development site.
- Measures to mitigate or prevent any negative effects from the building work during construction (temporary effects) and after completion (during use phase, permanent effects).
- Measures to magnify any positive effects of the building work during construction (temporary effects) and after completion (during use phase, permanent effects).
- Description of how the above measures will be implemented, monitored and, where necessary, corrected during the building work.
- Description of how the above measures will be implemented, monitored and, where necessary, corrected by the user during the use phase (management plan).

The above descriptions/analyses and plans must be written by a recognized ecologist.

There will be a qualitative assessment of the plan. Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

The evidence that has to be provided

The applicant must submit an ecological report and demonstrate that it was written by an expert. The applicant must also submit references and design drawings and descriptions demonstrating that the measures proposed by the ecologist have been integrated in the design.

Description of how the information/evidence provided will be tested and assessed on submission of the application (during selection procedure)

The municipality will determine whether the plan has been submitted and complies with the specified requirements/criteria. There will also be an assessment of whether the design corresponds with the measures proposed in the ecological plan for the relevant elements.

Description of how performances will be tested and assessed after the application (later in the process/lifespan)

There may be verification that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion. Possibly to be verified by a recognized ecologist.

ADAPTIVITY AND RESILIENCE| CIRCULAR INDICATORS

Theme: Adaptivity and Resilience **Type of indicator: Product**	**1. Reduced dependence on external materials and energy streams (RA)**
This indicator evaluates the extent to which the building or area depends on external energy streams, scarce materials and food, thereby testing the vulnerability to disruption of these streams.	
Relevance in the circular economy	In a circular economy, activities and systems are designed to be resilient, so that external shocks do not cause serious disruption to the systems. For the built environment, this means that any form of self-sufficiency or reduced dependence on crucial streams is encouraged.
Metric and formula	Quantitative calculation of lack of dependence in external streams of food, energy and critical materials: RA = Energy Matching score + % food independence - (Established critical materials * estimated replacement frequency of materials)

Data

Necessary data:	Energy Matching	**Owner of data:**	Designer
Necessary data:	Food independence	**Owner of data:**	Designer
Necessary data:	Replacement frequency of materials	**Owner of data:**	Designer

Phase of the life cycle at which indicator can be calculated: **design**

Information for Tender Team

Specific objective (to be formulated in request for tender)

In a circular economy, activities and systems are designed to be resilient, so that external shocks do not cause serious disruption to the systems. For the built environment, this means that any form of self-sufficiency or reduced dependence on crucial streams is encouraged.

Description of minimum requirement (ground for exclusion)

Not applicable

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

Not applicable

QUALITATIVE SCORING

This indicator is a combination of two other indicators, supplemented by aspects relating to food independence.

Indicator Energy 5.	Energy matching (EM)
Indicator Materials 9.	Use and capture of scarce and critical materials (KM)

The applicant can adopt measures in the design that could mitigate or prevent problems arising from a scarcity of energy and materials, and possibly food.

The applicant must submit an action plan describing the measures to be taken, together with design drawings and specifications from which these measures are also evident.

There will be a qualitative assessment of the action plan. Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

The evidence that has to be provided

The applicant must submit an action plan with the measures to be taken to mitigate or prevent problems arising from a scarcity of materials, energy and/or food. The action plan must describe/summarize the measures that are incorporated in the design of the building and the site. The applicant must also provide design drawings and,if necessary, specifications, to underpin the measures.

Description of how the information/evidence provided will be tested and assessed on submission of the application (during selection procedure)

There will be a qualitative assessment of the action plan and the supporting drawings and specifications. A score will be given for each of the sub-indicators, according to the extent to which the assessor feels that the principles of anticipating possible future scarcity of materials, energy and/or food are complied with.

Description of how performance will be tested and assessed after the application (later in the process/lifespan)

There may be verification that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion.

ADAPTIVITY AND RESILIENCE| CIRCULAR INDICATORS			
Theme: Adaptivity and Resilience **Type of indicator:**	**2.Climate-resilient building (KB)**		
This indicator evaluates the vulnerability of a building or area to external shocks that might be expected due to climate change, including risks associated with flooding and heat.			
Relevance in the circular economy	In a circular economy, external shocks due to climate change will cause little or no disruption of systems. Because climate change also poses a growing risk for Amsterdam, resilience in the context of the built environment also includes climate resilience. Vulnerability to flooding and heat waves is the major risk to be considered.		
Metric and formula	Quantitative calculation of flood- and heat-resilience: KB = Score for rain-proof design + Urban heat island mitigation (insulation value + albedo effect surfaces + evaporation from plants).		
Data			
Necessary data:	Rain-proof design	**Owner of data:**	Designer and/or hydrologist, see rain-proof design indicator
Necessary data:	Urban heat island mitigation score	**Owner of data:**	Designer and/or specialist
Phase of the lifecycle at which indicator can be calculated: **design**			
Information for Tender Team			
Specific objective (to be formulated in request for tender)			
In a circular economy, external shocks due to climate change will cause little or no disruption of systems. Because climate change also poses a growing risk for Amsterdam, resilience in the context of the built environment also includes climate resilience. Vulnerability to flooding and heat waves is the major risk to be considered.			
Description of minimum requirement (ground for exclusion)			
No minimum requirement.			
Description of how points can be earned, up to the maximum score			
QUANTITATIVE SCORING			
Not applicable			
QUALITATIVE SCORING			

ADAPTIVITY AND RESILIENCE| CIRCULAR INDICATORS

The applicant can adopt measures in the design to mitigate or prevent problems arising from climate change and excessive rainfall.

The applicant must submit an action plan describing the measures to be taken, together with design drawings and specifications from which these measures are also evident

This indicator consists of two sub-indicators: Rain-proof Building and Urban Heat Island Mitigation.

Rain-proof Building

A non-exhaustive list of measure that could be taken (at the discretion of the applicant) are (50% of the score):

- Raised construction
- Threshold or elevated floor
- Pump with check valve
- Design water-resistant basements
- Make indoor utilities rain-proof
- Rain-proof construction and choice of materials
- Sealable buildings
- Temporary flood defences.
- Green roofs and/or walls
- Sustainable water storage measures, so that peak drainage speed from the building/location to waterways is reduced (Reference: BREEAM-NLPOL 6 streaming rainwater)
- Sustainable infiltration measures, so that peak drainage from the building/location to waterways is reduced (Reference: BREEAM-NLPOL 6 streaming rainwater)

Urban Heat Island Mitigation

A non-exhaustive list of measures that could be taken (at the discretion of the applicant) are (50% of the score):

- Green roofs and/or walls
- Vegetation on the site, landscaping
- Shade provided by buildings and vegetation /plants
- Choice of finishing materials for the building's skin, including the choice of light and darker colours for the finish of walls and roofs

The total score for this element is determined by adding the scores for the sub-indicators.

The measures proposed in the action plan for each sub-indicator will be assessed. The more measures that are implemented, the higher the score.

There will be a qualitative assessment. A maximum of 10 points can be earned for each sub-indicator

Total score = (sub-score 1 + sub-score 2) x 5 points = . **Points (maximum 100 points)**

The evidence that has to be provided

The applicant must submit an action plan with the measures to be taken in relation to climate change and rain-proof building. The action plan must describe/summarize the measures that will be incorporated in the design of the building and the site. The applicant must also submit design drawings and, if necessary, specifications to underpin the measures.

Description of how the information/evidence supplied will be tested and assessed on submission of the application (during selection procedure)

There will be a qualitiative assessment of the action plan and the supporting drawings and specifications. Scores will be given for the two sub-indicators, according to the extent to which the assessor feels that the principles of anticipating climate change and rain-proof building are complied with.

Description of how performance will be tested and assessed after the application (later in the process/lifecycle)

There may be verification that the action plan has been implemented and the conclusions from the analysis have been executed when the application for an environmental permit is submitted, and possibly on completion.

ADAPTIVITY AND RESILIENCE| CIRCULAR INDICATORS

Theme: Adaptivity and Resilience **Type of indicator:**	**3. Integration in urban planning (ISP)**
This indicator evaluates the degree to which the design of the building/buildings takes account of the current urban development plans (zoning) and likely future changes to them.	
Relevance in the circular economy	Adaptivity is not only important in the building itself, but also in the area: if in future an area is likely to be designated for different functions than at the time of construction, that should already be taken into account during the design and construction phase in order to ensure that the building and the energy and materials embodied in it continue to perform a suitable function in the city in the long term.
Metric and formula	Quantitative calculation, binominal variable: 0 points or 100 points depending on whether or not the final design contains an appendix with an action plan addressing: • a possible change of function of the plot in transition areas • possible future expansion/change of functions in the public space.

ADAPTIVITY AND RESILIENCE| CIRCULAR INDICATORS			
Data			
Necessary data:	Final design	**Owner of data:**	Designer, builder
Necessary data:	Appendix with plan for integrating the area now and in the future	**Owner of data:**	Designer, builder
Phase of the life cycle at which the indicator can be calculated:			

This indicator is not separately assessed for Circular. This is done at planning level (the municipality), or in some cases can be assessed with the assessment of Design (which is always an important criterion in tenders, in addition to sustainability/circular. Qualitative assessment (as always with "design").

ADAPTIVITY AND RESILIENCE| CIRCULAR INDICATORS			
Theme: Adaptivity and Resilience **Type of indicator:**	**4. Flexible, redundant and adaptive design (FO)**		
This indicator evaluates the extent to which the building is flexibly designed to facilitate different functions in the future, infrastructure is adaptable to future shifts and transitions, and both infrastructure and the building have a redundant design to absorb increases or declines in capacity.			
Relevance in the circular economy	In adaptive design, an important characteristic of the circular economy, systems are self-organizing by observing external shocks and then restructuring themselves to meet the requirements of the new situation. This applies in the built environment for the capacity and function of buildings and infrastructure, which should be highly adaptive.		
Metric and formule	Qualitative assessment of the flexibility and redundancy of buildings and infrastructure: FO = 33.3% points per element • Building flexibility: ....% (score BREEAM MAT 8, Building flexibility) • Redundancy: building structures and infrastructure have an average overcapacity or bearing capacity of 40%, and it is no lower than 10% in any element • Adaptivity of infrastructure: SWOT analysis shows that the design could be integrated in different infrastructure transition scenarios		
Data			
Necessary data:	Building flexibility	**Owner of data:**	Designer (see BREEAM New construction, MAT 8)
Necessary data:	Redundancy of building and infrastructure	**Owner of data:**	Designer
Necessary data:	Adaptivity of infrastructure	**Owner of data:**	Designer
Phase of the life cycle at which indicator can be calculated: **design phase**			
Information for Tender Teams			
Specific objective (to be formulated in request for tender)			
In adaptive design, an important characteristic of the circular economy, systems are self-organizing by observing external shocks and then restructuring themselves to meet the requirements of the new situation. This applies in the built environment for the capacity and function of buildings and infrastructure, which should be highly adaptive.			
Description of minimum requirement (ground for exclusion)			
No minimum requirement			
Description of how points can be earned, up to the maximum score			
QUANTITATIVE SCORING			
Not applicable			
QUALITATIVE SCORING			

ADAPTIVITY AND RESILIENCE| CIRCULAR INDICATORS

This indicator consists of three sub-indicators, each of which counts for one-third of the total score for the indicator.

Building flexibility

The first sub-indicator relates to the building's flexibility, as calculated with the BREEAM-NL-2014, MAT 8 Calculation tool. The tool covers 13 elements, for which 1, 2, 3 or 4 has to be chosen. Although this BREEAM credit does not apply for residential building, various elements are relevant in relation to possible future changes and transformations (to other functions, for example).

1. Possibility to lay out according to a particular template (depth) for the column placement between the outer walls.
2. What internal walls will be used, and to what extent are the internal walls moveable and reusable?
3. How are the E-facilities designed; in one or two directions and in a grid (pointed) or in a duct (line)?
4. Possibility of layout for E-installations and W-installations in accordance with the existing (wall) template of the building.
5. What function-separating walls are used and to what extent are they moveable and reusable?
6. Position of entrance and core (staircase and/or lift) in the building.
7. Does the building have a supporting wall and/or obstacles in the space?
8. Possibility to divide the surface area into units of the prescribed size.
9. Presence of the following facilities per unit: pantry, meter cabinet, sanitary facilities.
10. Useful supporting capacity of the design.
11. Floor area of the wall zone with windows (7 meters deep) as percentage of total gross floor area.
12. Dimensions of the net internal height.
13. Where are the installations located?

Maximum score per sub-indicator = 50 points. Total score = % achieved in MAT 8 calculation (maximum 100%) x 50 points.

Redundancy

The second sub-indicator concerns the envisaged redundancy in building structures and infrastructure. The applicant must submit a plan showing the extent to which redudancy has been taken into account and why the particular dimensions/redundancy have been chosen. The applicant can also sketch future scenarios which show that the chosen redundancy is appropriate or adequate.

There will be a qualitative assessment of this sub-indicator. Maximum 20 points (0, 4, 6, 8 or 10 (= assessment figure) x 2 points)

Adaptivity of infrastructure

The third sub-indicator is the extent to which the infrastructure/installations (or the concept/design for them) take account of future developments such as expansion, transformation, change of function and new technological developments, and associated installations/components.

A SWOT analysis must be performed on the basis of the concept for the installations as envisaged in the design at the time of the application. The analysis must provide insight into the consequences of the various future scenarios as described above, and measures that could be taken to modify the infrastructure in the event of those scenarios.

There will be a qualitative assessment of this sub-indicator. Maximum 30 points (0, 4, 6, 8 or 10 (= assessment figure) x 3 points)

Total score = sub-indicator 1 (maximum 50) + sub-indicator 2 (maximum 20) + sub-indicator 3 (maximum 30) = ... points (maximum 100).

The evidence that has to be provided

The applicant must submit the following documents with the application:

- The calculation in accordance with BREEEAM-NL-2014, MAT 8.
- The applicant's plan for possible/necessary redundancy in the building, with an analysis and conclusion for the selected "dimension".
- The SWOT analysis of the possibilities for, consequences of and measures to make modifications to the infrastructure in various future scenarios.
- Design drawings and details must also be provided as further underpinning of the calculations and analyses.

Description of how the information/evidence supplied will be tested and assessed on submission of the application (during selection procedure)

The municipality will determine whether the requested data and the drawings and supporting documents have been submitted and meet the specified requirements/criteria. The outcome of the calculation (percentage) submitted by the applicant will be assessed (1/3 of the score). There will also be a qualitative assessment of the other two elements (2 x 1/3 of the score). The combined score of the three sub-indicators will form the total score.

Description of how performances will be tested and assessed after the application (later in the process/lifespan)

There may be verification that the action plan has been implemented and the measures have actually been executed when the application for an environmental permit is submitted, and possibly on completion.

ADAPTIVITY AND RESILIENCE| CIRCULAR INDICATORS

Theme: Adaptivity and Resilience **Type of indicator: Product**	**5. Information management systems (IS)**

This indicator evaluates the extent to which all the information that might be needed for future modification of buildings, elements and materials exists and is accessible.

Relevance in the circular economy	Increasing the adaptive capacity of buildings and the area also increases the chance of materials, elements and buildings having a lengthy functional lifespan or being reused elsewhere.

ADAPTIVITY AND RESILIENCE| CIRCULAR INDICATORS			
Metric and formula	Quantitative calculation: IMS = 33.33 points per element: • Digital building passport with type and quantity of materials • Digital building passport with connections, and instructions for disassembly • Digital building passport with parameters for multifunctional use (e.g., load-bearing capacity of floors and roofs)		
Data			
Necessary data:	Building passport Design BIM system	**Owner of data:** **Owner of data**	Builder, designer Builder, designer Builder, designer

Phase of the life cycle at which indicator can be calculated: **final design**

Information for Tender Team

Specific objective (to be formulated in request for tender)

Increasing the adaptive capacity of buildings and the area also increases the chance of materials, elements and buildings having a lengthy functional lifespan or being reused elsewhere.

Description of minimum requirement (ground for exclusion)

Not applicable

Description of how points can be earned, up to the maximum score

QUANTITATIVE SCORING

Not applicable

QUALITATIVE SCORING

The applicant must submit a vision/concept or action plan for drafting a digital information management system and delivering it on completion.

The vision/concept or action plan must describe the aspects that are being incorporated in the system, how the system will be setup and developed, and how it can be used by the building's owner/manager during the use phase and in the future. Aspects that can/should be included are mentioned in Materials indicator 11 (Material passport) and include:

Materials indicator 2	Environmental impact of purchased materials = type and quantity of materials
Materials indicator 3.	Design for disassembly, specifications for connections/method of assembly/demountability
Materials indicator 4.	Theoretical reusability of materials or components at equivalent level of quality (HM)

Aspects showing future adaptability, flexibility, etc. can also be considered. See also:

Adaptivity and resilience indicator 4.	Flexible, redundant and adaptive design

There will be a qualitative assessment of the action plan. Maximum 100 points (0, 4, 6, 8 or 10 (= assessment figure) x 10 points)

Description of the evidence required

The applicant must submit an action plan with a description of how an Information Management System with information about the materials used in the building, the building methods, connections, the method of assembly and instructions for disassembly and the building's adaptability and flexibility will be set up and managed and handed over on completion. The information management system must be easy for the building's owner/manager to use and come with instructions for the use and maintenance of the system.

Description of how the information/evidence supplied will be tested and assessed on submission of the application (during selection procedure)

The municipality will conduct a qualitative assessment of the plan for creating, delivering and managing the information management system, with the outcome expressed in a score.

Description of how performances will be tested and assessed after the application (later in the process/lifespan)

There may be verification that the action plan has been implemented and the measures have actually been executed when the application for an environmental permit is submitted, and possibly on completion.

B1: Overview of data required for calculation of the criteria

Indicator	Requested Data	References/examples/background information
Version 4	14 April 2017 Note: under "Requested Data" it is assumed that a quantitative assessment will be required under "references/examples/background info", credits are shown which may contain more information relating to the indicator.	
	Intensity of material use of building over the life cycle	
	Life cycle analysis specification of elements and materials quantity of elements and materials functional lifespan of building as a whole functional lifespan of elements and materials design drawings details	BREEAM MAN 12, excluding the costs. Focus on material use BREEAM MAT 1 (specifications of materials and quantities)
MBM	**Environmental impact of purchase materials**	
	Environmental Performance of Buildings calculation specification of elements and materials quantity of elements and materials functional lifespan of building as a whole (established with BREEAM MAT 1) functional lifespan of elements and materials (National Environmental Database) design drawings details	BREEAM MAT 1 GPR 2.1
OVD	**Design for disassembly**	
	Specification of connections and aspects/parts design drawings specifications and details	Final report 'Gebouwen met toekomstwaarde!', Appendix with assessment framework, indicators for Performance requirements, Brink Group / CPI BREEAM MAT 7 and MAT 8
HM	**Theoretical reusability of materials or components at equivalent level of quality**	
	Environmental Performance of Buildings calculation specification of elements and materials quantity of elements and materials list of building parts/elements whose theoretical reusability is determined in the list: composition of element/method of attachment/assembly and estimated lifespan design drawings details	BREEAM MAT 1 BREEAM MAT 8
SM	**Use of secondary materials for building**	
	Environmental Performance of Buildings calculation specification of elements and materials quantity of elements and materials list of building parts/elements with source, certificates or declarations percentage of secondary materials must be clear from this information On the basis of that: weight/volume of secondary materials in building	BREEAM WST 2 BREEAM MAT 1 and MAT 5
HC	**Reuse of earth and residual streams during construction**	
	Environmental Performance of Buildings calculation specification of elements and materials quantity of elements and materials analysis/estimate of waste released during construction action plan for *in situ* waste management	BREEAM MAT 1 BREEAM WST 1
CCI	**Policy on circular contracting with fitters**	
	See also Energy 7 (PC)	GPR process quality energy

Indicator	Requested Data	References/examples/background information		
Version 4	14 April 2017 Note:	under "Requested Data" it is assumed that a quantitative assessment will be required under "references/examples/background info", credits are shown which may contain more information relating to the indicator.		
DIM	**Sustainable procurement of materials**			
	Environmental Performance of Buildings calculation	BREEAM MAT 1		
	specification of elements and materials	BREEAM MAT 5		
	quantity of elements and materials			
	MAT 5 calculation (BREEAM as reference)			
	breakdown into main building elements			
	statement of the number of elements making up the main building element			
	overview of the elements (name) making up the main building element			
	total volume of each element			
	volume of each material present in the element (this adds up to the volume of the element, see previous line)			
	Tier-level of all materials, as far as it is known and can be entered			
KM	**Use and capture of scarce and critical materials**			
	List of elements and materials			
	type and quantity of material (volume/weight)			
	composition of element			
BBM	**Biobased Materials / use of renewable materials**			
	Environmental Performance of Buildings calculation	BREEAM MAT 1		
	specification of elements and materials			
	quantity of elements and materials			
	List of elements/applications containing renewable materials			
	Type and quantity of material (volume/weight)			
	Composition of element			
	design drawings			
	details			
MP	**Material passport**			
	Environmental Performance of Buildings calculation	MBM	BREEAM MAT 1	BREEAM MAN 12
	specification of elements and materials			
	quantity of elements and materials			
	Sustainable procurement of materials	DIM		BREEAM MAT 5
	type and quantity of materials (volume/weight)			
	Source of materials/element		BREEAM WST 2	
	Design for disassembly	OVD	BREEAM MAT 8	
	Reusability of materials	HM		
	Robust building		BREEAM MAT 7	
	design drawings			
	details			
CMS	**Circular materials score**			
	Environmental Performance of Buildings calculation	MBM	BREEAM MAT 1	
	specification of elements and materials			
	quantity of elements and materials			
	Use of renewable materials	BBM	from MAT 1	
	Reusability of materials	HM	from MAT 1	
	Critical materials	KM	from MAT 1	
	Secondary materials	SM	BREEAM WST 2	
	design drawings			
	details			
Indicator	Requested Data	References/examples/background information		

Indicator	Requested Data		References/examples/background information
Version 4	14 April 2017	Note:	under "Requested Data" it is assumed that a quantitative assessment will be required under "references/examples/background info", credits are shown which may contain more information relating to the indicator.
Version 4	14 April 2017	Note:	under "Requested Data" it is assumed that a quantitative assessment will be required under "references/examples/background info", credits are shown which may contain more information relating to the indicator.

WV	**Water consumption**	
	Specifications for flushing toilets	BREEAM WAT 1
	Specifications for taps	BREEAM WAT 6
	Specifications for showers	
	Specifications for other appliances	
	Supporting design drawings	
	Water-saving calculation	
	GFA m², number of dwellings, number of persons	
CW	**Cascading water streams**	
	Specifications and calculation for rainwater storage tanks	BREEAM WAT 5 BREEAM POL 6
	Specifications and calculation for irrigation method for green space	BREEAM WAT 6
	Specifications and measures for recovery of gray water and rainwater for reuse	
	Supporting design drawings	
NH	**Recovery of nutrients from waste water**	
		BREEAM WAT 5
		BREEAM POL 6
MFW	**Monitoring and feedback for water management system**	
	Action plan and specifications for water meter(s)	BREEAM WAT 2
	Supporting design drawings	
RBO	**Rain-proof design**	
	Action plan with measures for rain-proof building	BREEAM POL 5
	Action plan for rainwater run-off	
	Supporting design drawings	
	Specifications of facilities	

Indicator	Requested Data		References/examples/background information
Version 4	14 April 2017	Note:	under "Requested Data" it is assumed that a quantitative assessment will be required under "references/examples/background info", credits are shown which may contain more information relating to the indicator.

EE	**Energy efficiency**	
	EPC calculation with evidence/declarations	BREEAM ENE 1 / GPR 1.1
	Design drawings	
	GFA m², UFA m², number of dwellings, number of persons	
IE	**Embodied energy**	
	See Materials 2, MBM.	BREEAM MAT 1
EC	**Energy cascading**	

Indicator	Requested Data	References/examples/background information
Version 4	14 April 2017 Note: under "Requested Data" it is assumed that a quantitative assessment will be required under "references/examples/background info", credits are shown which may contain more information relating to the indicator.	
	EPC calculation with evidence/declarations Design drawings Specifications for EC parts shower WTW (also EPC) daylight use to reduce lighting daylight use to reduce heating use of residual heat from outside the building etc. …	BREEAM ENE 1 / GPR 1.1 BREEAM ENE 5
THE	Renewable energy	
	EPC calculation with evidence/declarations Research into possibilities for renewable energy Calculation of annual energy demand Calculation of annual renewable energy generated Declaration of annual procurement of renewable energy	BREEAM ENE 1 / GPR 1.1 BREEAM ENE 5
EM	Energy matching	
	EPC calculation with evidence/declarations Energy profile of consumption Energy profile of generation and storage of energy Matching use and generation and storage	BREEAM ENE 1 / GPR 1.1 BREEAM ENE 5
PF	Performance feedback	
	Energy metering plan	BREEAM ENE 2
PC	Performance contracting for energy systems	
	See also Materials 7 (CCI)	GPR process quality energy

Indicator	Requested Data	References/examples/background information
Version 4	14 April 2017 Note: under "Requested Data" it is assumed that a quantitative assessment will be required under "references/examples/background info", credits are shown which may contain more information relating to the indicator.	
IEE	Embodied ecosystem impact	
	See Materials 2, MBM.	BREEAM MAT 1
ED	Ecosystem services	
	Design drawings for building and site Planted applications with surface area, type/species Calculation of CO2 sequestration with planted species Calculation of particulate matter reduction with planted species Calculation of water buffering with planted surface area and used species Conversion factors for above indicators	BREEAM WAT 5 and WAT 6 BREEAM LE 4
BLD	Enhancing local biodiversity	

Indicator	Requested Data		References/examples/background information
Version 4	14 April 2017	Note:	under "Requested Data" it is assumed that a quantitative assessment will be required under "references/examples/background info", credits are shown which may contain more information relating to the indicator.
	Design drawings for building and site Ecological report, written by certified ecologist: • Description and analysis of the ecology of the development location and the vicinity in the current situation. • Measures to mitigate or prevent negative effects of building work during construction (temporary effects) and after completion (in use phase, permanent effects). • Measures to magnify positive effects of building work during construction (temporary effects) and after completion (in use phase, permanent effects). • Description of how above measures will be implemented, monitored and, if necessary, corrected during the building work. • Description of who will implement, monitor and, if necessary, correct the above measures after completion, during the use phase (management plan).		BREEAM LE 3 and LE 4 and LE 6

Indicator	Requested Data		References/examples/background information
Version 4	14 April 2017	Note:	under "Requested Data" it is assumed that a quantitative assessment will be required under "references/examples/background info", credits are shown which may contain more information relating to the indicator.

RA	**Reduced dependence on external materials and energy streams**	
	To be determined. Also relationship with KM and EM.	BREEAM MAN 11, MAN 12, ENE 1, ENE 5 BREEAM MAT 1 and MAT 5
KB	**Climate proof building**	
	Action plan with measures in relation to climate change and rain-proofing. See also RBO. in relation to preventing Urban Heat Island effects Design drawings and specifications, showing the implementation of measures	BREEAM LE 4 and LE 6 BREEAM POL 6
ISP	**Integration in urban planning**	
	Not separately assessed for circular/adaptivity. Covered under assessment of design.	
FO	**Flexible, redundant and adaptive design**	
	MAT 8 calculation from BREEAM-NL 2014 guidelines Applicant's plan for redundancy/overdimensioning, with analysis and conclusions SWOT analysis of measures to address changes to infrastructure in various future scenarios. Design drawings and principle detailing showing (possible) measures in relation to the above	BREEAM MAT 8 BREEAM LE 9
IS	**Information management system**	
	Combination with MP (Materials 11.)	BREEAM MAN 11, MAN 12, MAT 1, MAT 5, MAT 8

Indicator	Requested Data		References/examples/background information
Version 4	14 April 2017	Note:	under "Requested Data" it is assumed that a quantitative assessment will be required under "references/examples/background info", credits are shown which may contain more information relating to the indicator.

Indicator	Requested Data		References/examples/background information
Version 4	14 April 2017	Note:	under "Requested Data" it is assumed that a quantitative assessment will be required under "references/examples/background info", credits are shown which may contain more information relating to the indicator.

If applicants are not or cannot be asked for information on the above aspects in the request for tender, a vision or action plan will be requested. In that case, there will be a "non-quantitative" assessment. The table below contains a scale that could be used to rate applications (for the indicators or combinations of indicators). If it is later verified that the vision/action plan has actually been implemented; this data, which will be available by then, can then be used for a "quantitative" assessment, as shown for most of the indicators.

Points	Explanation
0	No score. The assessors find that the applicant has not done what was requested or has totally ignored the request.
4	The assessors find that the applicant has not adequately addressed the substance of the elements and aspects requested. The applicant has not taken sufficient account of the principles specified for the selection. The wishes of the assessment committee or the client have not been fully addressed.
6	The assessors find that the applicant only partially addresses the substantive elements and aspects requested. The applicant has taken account of the principles specified for the selection, but not sufficiently. The wishes of the assessment committee or the client have not been fully addressed.
8	The assessors find that the applicant has substantively addressed the requested elements and aspects. The applicant has taken adequate account of the principles specified for the selection. The wishes of the assessment committee or the client have been addressed.
10	The assessors find that the applicant has substantively addressed the requested elements and aspects very well. The applicant has taken full account of the specified principles for selection. The wishes of the assessment committee or the client have been addressed very well.

B2: Sample text for a circular tender

SAMPLE TENDER TEXT	JANUARY 2017 (selection of relevant sections -> places where text can be taken from the indicators)

1.5 Sustainability

With the Sustainability Agenda that was adopted on 11 March 2015, Amsterdam's city council confirmed the city's ambitions for sustainability. For new construction, the target is that in 2020 all new residential buildings and utilities will be energy-neutral. The aim is that 75% of the programme in the agreements concluded with property developers after 1 January 2015 will be energy-neutral. Although the Building Decree is the baseline, in accordance with the European Directive (at the time of the current selection procedure the EPC is 0.4), the market will simultaneously be challenged to voluntarily exceed that standard. Developers will have an incentive to do so because the municipality will assign a minimum of 30% to the criterion of sustainability in the selection of the plans and parties for development projects. That also applies for the present selection procedure, in which sustainabilty is operationalized in the form of a description based on the Building Research Establishment Environmental Assessment Method (BREEAM) which the parties have to submit with their application.

2 1 Introduction

The municipality requests all candidates in this selection procedure, and which meet the requirements and conditions laid down in this brochure (including the appendices), to submit the following documents at the time of the final section at the latest:

(1) A preliminary design, which will be assessed on its quality;
(2) a BREEAM-NL rating (sustainability);
(3) a financial bid.

Sustainabilty/Circular as one of three criteria]

For this selection procedure, the municipality has chosen a system with an initial selection and a final selection. The municipality's intention in using this method is to limit the number of candidates that invest time and money in producing a preliminary design to four. The tendering party for this selection is the Municipality of Amsterdam, Land and Development, Area Development department.

...information about commencement date and publication of TENDER (Tendernet)

The procedure for the initial selection is a multiple, public request for tender. The documents specified in th
part of this brochure.

For a valid application for the final selection in this procedure, the applicant must submit the following info

1. A completed and validly signed Application form for final selection, including a financial bid and BREE
2. A completed and validly signed form required by the Public Administration (Probity Screening) Act (Bi each of the parties must have completed and validly signed the application form and the Bibob form;
3. Preliminary design and explanation, written and visual, of not more than 20 pages (A3 format) clearly met and containing at least (scale 1:500):
   a. Plan of the plinth/ground floor with the public space and an indication of functions, public entr
   b. Plan of unique/relevant floors, including the roof;
   c. A view of each façade;
   d. Cross-sections/profiles with an indication of the connection with the environment (quay and w
   e. Impressions from three angles at street level, which give a clear impression of the envisaged c
   f. Explanation of the preliminary design:
      i. mention five crucial main points of characteristics of the design;
      ii. describe the quality of the design;
      iii. describe the architectural impression and vision with a list of materials, colours, visual quality and obsolescence;
      iv. present the programme in a table with m² GFA/GUA and numbers;
      v. provide underpinning for the residential and services programme, public functions and parking;
      vi. include an action plan showing how the programme and design for hull homes will be implemented;
      vii. indicate what suggestions in the inspiration document have been incorporated in the preliminary design, and why;
      viii. present the results of a general wind study.

Requested with Tender (not exhaustive):

Envisaged BREEAM score

Preliminary design, written and visual:
- situation
- maps
- walls
- cross sections
- impressions

explanation, including
main qualities
list of materials,colours
visual qualityand obsolecence
Programme table with m2 GFA/GUA
underpinning of programme

4.3 Contract award criteria and assessment of final selection

a) Sustainability

It is a major ambition of Amsterdam to become more sustainable. In this selection, the BREEAM-NL meth
contains the following criteria. For an explanation of the criteria and the scores, see www.BREEAM.nl.

Pass
Good
Very Good
Excellent
Outstanding

Applicants are asked to say which of the BREEAM criteria they envisage complying with in the building or phase, you must submit a BREEAM design certificate showing that your design complies with the percent definitive BREEAM completion certificate showing that the project complies with the percentages specified in the application.

For this aspect, points can be earned as follows:

A BREEAM rating of 'Outstanding' yields 30 points, the maximum number of points for this aspect. The rating of 'Excellent' yields 20 points and 'Very Good' yields 10 points. The lower ratings of 'Pass' and 'Good' do not yield any points for sustainability.

Contract award criteria for Sustainability:
expressed in BREEAM score
EPC requirement of 0.4 is mentioned,
market is challenged
Award criterion Quality, includes:
Preliminary design and programme
Relationship with environment, planning
Programming and flexibility
Architectural design with materials
Spatial sustainability, functions and
environment, also in the future

b) Quality

The plot is situated in a prominent location in the port. The preliminary design submitted by the applicant and the building programme should together bring life to the port and something extra to IJburg and the city. In addition to the option bid and sustainability, the design will therefore also be assessed. Applicants must submit a preliminary design with explanatory notes, which will be subject to a qualitative assessment on the basis of the assignment described in the building envelope. The preliminary design must therefore fall within the framework of the building envelope.

The juryof experts will adopt the following criteria in assessing the quality of the design:

◊ Character
  appeal, identity, atmosphere, *zeitgeist*
◊ Planning concept
  Relationship with the surrondings, types of space
◊ Public spaces
  use, ratio of public-private, materialization
◊ Programming
  functional/organizational, target groups, water programme, public/collective/private, outdoor spaces
◊ Architectural concept
  Spaces and volumes, typology, interior and exterior, frontage and cross-sections, materials, detailing
◊ Logistics
  How residents and visitors will find their way around the area and the building/buildings
◊ Spatial sustainability
  how the structure of the plan allows for change of use over time
◊ Synergy
  how the various elements and aspects of the plan come together in a coherent and attractive unit; the added value that this creates
◊ Inspiration document
  how the design incorporates the suggestions in the inspiration document

Documents to be provided as evidence, including:
With tender
statement of envisaged BREEAM score (see above)

During development process:
Design phase: BREEAM design certificate
Construction phase: BREEAM completion certificate [no "sanctions" .. how will this be guaranteed?]
Exploitation / use phase:

Description of assessment method

The selection committee appointed by the municipality will assess the applications for completeness, feasibility, against the mnimum requirements and the basic conditions according to the building envelope. The preliminary design with explanatory notes that is submitted will be assessed by the jury of experts. The jury will submit a written report to the selection committee with its assessment of the design on the crtierion of quality. The jury's report will consist ofa single illustration for each applicant, a substantive characterization and a written assessment of the plan. The jury will explain thes reasons for its ranking of the plans on the grounds of the stated qualitative criteria and award a score to each applicant.

The preliminary design will be assessed as a whole, leading to a certain number of points on the criterion of quality. The applicant whose design has been judged as best by the jury of experts will receive 60 points, the maximum number of points for this aspect. The other applicants will receive scores of between 0 and 59 points.

B3: Relationships between criteria for circular building and existing criteria

CREDIT LIST BREEAM NEW CONSTRUCTION 2014 v.1.01 – relationship with framework of indicators

+	BREEAM credit bears little relation to indicator, or contains interesting background information
++	BREEAM credit is related to indicator, and can be used in part
+++	BREEAM credit corresponds (almost) entirely with indicator

		MA N 1	MA N 11	MA N 12	ENE 1	ENE 2	ENE 5	WA T 1	WA T 2	WA T 5	WA T 6	MA T 1	MA T 5	MA T 7	MA T 8	WS T 1	WS T 2	LE 4	LE 6	LE 9	PO L 5	PO L 6
1.	IM			+								++										
2.	MBM											+++										
3.	OVD													++	++							
4.	HM											++			+							
5.	SM											++	+				++					
6.	HC											+				+++						
7.	CCI																					
8.	DIM											++	+++									
9.	KM																					
10.	BBM											++										
11.	MP			+								+++	+++	++	+		++					
12.	CMS											+++					++					
1.	WV							+++			+											
2.	CW									+++	+++											+
3.	NH									+												+
4.	MFW								+++													
5.	RBO																				++	
1.	EE				+++							+++										
2.	IE																					
3.	EC				++		+															
4.	THE				++		+++															
5.	EM				++		++															
6.	PF	+				+++																
7.	PC																					
1.	IIE											+++										
2.	ED									++	++							+++				
3.	BLD																	+++	+++			
1.	RA		+	++	+		++					+++	++									
2.	KB																	+	+		++	
3.	ISP																					
4.	FO											+++	+++		+++					+		
5.	IS		+	+											+++							

B4: Four principles of circular building for selected themes

Materials

The material stream must be entirely closed in both the construction and the use phase, either with technical measures (closed-loop material design) or biological management (exploitation of the purifying capacity of nature and ecosystem services). Materials will have to be selected and assembled in such a way that they retain highest possible complexity and value in successive cycles of their use (e.g., product, component, sub-component, and ultimately raw material, in that order). The material cycles must be designed in such a way that they address the priorities regarding concerns about toxicity and the locking in of scarce materials during a lengthy period of use. The materials must be selected in a manner that ensures the lowest impact throughout their entire functional lifespan. These objectives can be achieved by:

Reduction: By introducing best practises and technologies with the highest efficiency, material reduction can be realized throughout the lifecycle. This involves giving priority to the reuse of existing buildings and associated infrastructure over new build and optimizing existing infrastructure for new buildings. Over the entire functional lifespan of a building, the design should in general lead to the greatest possible reduction of material use in general, and more specifically to the use of materials with the lowest possible impact. This means that the input of materials must be in proportion to the ultimate lifespan. When a building is designed to stand for several hundred years – for example government buildings, museums, university buildings and hospitals – it is legitimate to invest in a sounder and more robust structure with a material-intensive design or with materials that have a larger impact (e.g., steel and concrete rather than wood). In general, the design should avoid the use of scarce and critical materials. Furthermore, if such materials are used, they should not be incorporated in a manner that prevents them from being recovered later for reuse.

Synergy: Every building should be designed flexibly in order to maximize the possibilities for its adaptation for different functions throughout its lifespan. The design must also contribute to the complete recovery of raw materials when a particular function comes to an end, and to ensure that the materials can have multiple life cycles. The potential for recovery of materials for high-value reuse can be increased by applying best practises in the domain of design for disassembly. Wherever it is possible and practical, material cascades should be implemented locally, for example procurement or reuse of local materials, or composting of local organic waste.

Production and procurement: Materials should be purchased from sources that have the lowest impact. This can be verified by adopting comprehensive criteria in life cycle analyses in order to minimize the impact of the materials. To evaluate the impact, an effective unit of measurement (which takes account of the number of years that a building or area will be used and the length of time various materials can fulfil their functions) will have to be formulated. Priority should be given to large and irreversible impacts (e.g., the loss of ecosystems/biodiversity) over impacts on a smaller scale (e.g., incremental increases in CO_2 emissions). Precedence should be given to the following aspects in selecting materials: reused/recycled materials, recyclable materials, compostable materials, renewable materials, materials whose source is verifiable through certification, non-toxic materials, low-VOC products, and modular components. However, the consequences of the choice of materials for the construction process in terms of the use of raw materials and their disposal at the end of their functional use has to be considered. This means, for example, that recycled materials can only be used up to the point where the impact of the construction process (in terms of energy use and waste production) does not exceed the potential reduction of the caused by the use of materials that can be reused in the future. Renewable materials should only be used if they are extracted sustainably (in other words, not when more is extracted than can be renewed, or when the extraction causes disproportionate damage to ecosystems, etc.).

Management: Ensure that there are material passports for every building, and prepare plans for demolition during the design process and the construction phase. Measures should also be taken to guarantee the safe storage of all the information about the source and properties of the materials during the building's entire functional lifespan. There should also be mechanisms in place to update the information in the event of redesign and renovation. The design should also include measures to guarantee waste management and reduction during the use phase (e.g., storage of food to minimize wastage, waste separation and storage). Develop and implement a material and waste management plan for reducing the volume of building and demolition waste during the construction phase. There should also be mechanisms in place for monitoring and providing feedback about waste during the use phase. They would include a monitoring system to enable equipment in the building to be properly maintained, and replaced if necessary.

Resilience and adaptivity

Economic structures are designed to be resilient and adaptive. Ideally, this resilience will absorb any breakdowns in or impacts on the system, thus ensuring that risks of the system collapsing (e.g., loss of energy or water supply) are avoided. If there are changes of function in the public space or at building level, an adaptive design means that modifications can be made relatively easily, thus guaranteeing that despite the changes the building will have a lengthy functional lifespan. These objectives can be achieved by:

Reduction: of dependence on external materials and sources of energy and water. Reducing dependence on central energy distribution (electricity and gas networks) and infrastructure for water treatment also helps to meet this objective.

Synergy: can be achieved with and in the built environment by carefully integrating developments at plot level into broader strategies for an area and spatial planning. This increases the chance that the building will continue to fit in with urban development and spatial planning frameworks in the long term. The building should also have an adaptive and multifunctional design to enable it to fulfil various functions throughout its lifespan.

Management: with adequate and up-to-date information about the state of energy and water supply infrastructure for the buildings, the local and central infrastructure and production can also be properly matched even in the event of changes. With information about demolition, new construction, and the various materials that are embodied in buildings,it is also possible to ensure that developments are geared to the urban material cycle.

Energy

The objective here is to achieve full energy-neutrality by making the energy supply entirely renewable. This can be achieved by:

Reduction: Maximum reduction is achieved by introducing best practises and technologies with the highest efficiency (without making any sacrifice in terms of quality of service – e.g., heating, lighting, showers, cleaning, etc.).

Synergy: Optimization of energy systems for exegetic performance (matching the quality of the energy demand and supply) and the ultimate use, with energy cascading being used wherever it is useful and feasible). Electricity, for example, is a highly exegetic form of energy and ideally should not be used for low exegetic purposes, such as heating, unless it improves the efficiency of the system as a whole. Heat energy can best be used directly for heating, with sources with similar temperatures being matched as far as possible.

Production and procurement: The aim is to supply 100% of the electricity and heat from renewable sources and as much as possible being generated locally (with the impact of developing local production and its efficiency being weighed against other options for production). In other words, every building (or area) should produce as much renewable energy as it needs (net annual amount). However, this should not be at the expense of the efficiency of the system in general. For example, if a building is erected in a very shaded area, it should not necessarily be fitted out with as many solar panels as possible. It would be better to install them on a nearby building.

Management: Maximize the direct and own use of renewable sources, by implementing smart energy systems that match local supply and demand and take account of daily and seasonal changes. The system should also incorporate feedback systems to provide users with details of their own energy consumption.

Water

Water is managed entirely according to circular principles by matching water consumption to the capacity of the local water cycle and by recovering all possible nutrients and raw materials from waste water. These objectives are achieved by :

Reduction: Maximum reduction is achieved by introducing best practises and technologies with the greatest efficiency throughout entire functional lifespan, for example by installing water-saving appliances or appliances that use water recycling. Avoid using materials that have a large water footprint or are purchased from regions facing high water stress (e.g., cotton for insulation).

Synergy: Optimize the water system for the best use of the water by matching the available water sources or residual stream to the end use. This means that potable water should ideally only be used for drinking, rather than for flushing the toilet or for cleaning. Wherever possible, waste water should be separated by type to maximize the recovery of raw materials and nutrients (the same applies for heat, medication, metals, etc.). In the process, all the impurities (and valuable raw materials) that introduced into the water cycle by humans should be filtered out before the water is returned to nature. Naturally, the exception to this rule is where nature is better equipped to purify the water, as with nutrient contamination, in which case the contaminated water can be allowed to flow back into the natural system.

Production and procurement: Ensure that the bearing capacity of the local water sources is not exceeded by means of water extraction (ensuring that sufficient remains for animals, natural water courses, ecosystem services, and to prevent the groundwater level from falling). The water should flow back to the correct point in the natural cycle within a reasonable period. Collect, treat and store as much water as possible locally and match the available quality to the various applications.

Management: In regions with heavy rainfall and where there is a risk of flooding, local rainwater and sewage systems have to be protected from being overwhelmed by making the design "rain-proof". This will also minimize the run-off of nutrients into the water. The impact of the resources needed to treat and manage water streams throughout the life cycle should be minimized by choosing the technologies best suited to collecting waste water and simultaneously minimizing the impact of the treatment of the water. It is also necessary to choose the correct scale, level of decentralisation, location and technology for the water treatment. Manage the quality of the local surface and groundwater,and establish an instrument for regulating and monitoring the production of waste water during the use phase.

Ecosystems and Biodiversity

Ideally, every project will have a positive impact on the surrounding ecosystems and biodiversity, but should in any case not have any negative effects during the functional lifespan. This can be achieved by:

Reduction: Disruption of natural ecosystems must be kept to a minimum. The impact of construction and impact related to land use can be minimized by selecting materials that are produced efficiently and whose impact on ecosystems is low. Selecting materials whose negative impact on biodiversity and animal welfare in minimal during the entire lifespan could also contribute to this. High levels of noise and light pollution should also be avoided during construction and use.

Synergy: Work with natural cycles rather than in opposition to them. Take advantage of the growth of local vegetation for natural shade, rainwater storage and ventilation. Knowledge of migration patterns and the needs of local species should also be considered in the design of the buildings,for example by preserving the habitats of existing species and ecological corridors. Production and procurement: Restore damaged habitats or create new ones. As much of the area as possible should be covered with vegetation and green space. The design should incorporate a wide variety of local plants in order to create a good basic habitat for insects, birds and other animals. Wherever possible and feasible, the possibility of developing local micro-ecosystems and elements of habitats (walls, roofs, terraces and gardens, for example) should be explored.

Management: To ensure the success of the planned interventions, an instrument to measure the quality of the ecosystem and the biodiversity should be implemented.


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