# Inquiry on perceptions and practices of built environment professionals regarding regenerative and circular approaches

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## Supplementary file 1

**SURVEY QUESTIONNAIRE**

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## BUILT ENVIRONMENT EXPERTS SURVEY

**TOWARDS A REGENERATIVE AND CIRCULAR BUILT ENVIRONMENT**
**Professionals' Perception Survey**

## GENERAL AWARENESS OF CONCEPTS

**2.1 How well do you know each of these terms or concepts?** (Adapted from/inspired by [1–3])

*Never heard of it | I've heard of it but don't understand it very well | Very well*

- Urban Metabolism
- Circular Economy or Circularity
- Urban mining
- Building as material banks
- Regenerative Development
- Citizen science
- Urban quality of life/liveability
- Ecosystem Services
- Biomimicry/Biomimetics
- Biophilic Design

**From now on, when we mention *Regenerative and Circular Built Environment* (RCBE), please consider the following definition:**

*A **regenerative and circular built environment** is one that goes beyond reducing damages to the planet and society and becomes generous by seeking positive impact at the local and global scales through a systemic and life cycle thinking that adopts circular cycles and just use of resources, technical solutions inspired by nature, regeneration of ecosystems and human relations, and provides inclusive, equitable and safe urban spaces based on people's needs and the local context. It does not focus on recycling materials, but rather on extending their lifetime and cycles of use while maintaining the quality and value of resources.*

## ATRIBUTING IMPORTANCE

**3.2 In your perspective, how important are these items in a regenerative and circular neighbourhood?** (Adapted from/inspired by [4,5])

*5-point Likert scale, + I don't know*

1. Accessibility for disabled people
2. Designated pedestrian crossings
3. Wayfinding/Signs for pedestrians
4. Honouring traditional/indigenous cultures/practices
5. Street trees
6. Accessible/nearby lakes and rivers
7. Other nearby green spaces, as parks
8. Diverse fauna/animals in public spaces
9. Landscape integrated drainage
10. Vegetated roofs and walls
11. Areas for exercise and play
12. Diversity of shops and basic services on walking distance
13. Mix of low, medium and high-rise buildings
14. Outdoor areas protected from weather (e.g. canopies)
15. Public seating areas
16. Visually permeable urban spaces
17. Public lighting at night
18. Community participation in governance
19. Diverse socio-economic background of residents
20. Car and bike sharing program
21. Free internet in public areas
22. Panels and sensors showing air quality, temperature, and noise levels
23. Cycle paths
24. Public transportation availability
25. Reduced public parking spots
26. Shelter and seating in transit stops
27. Transit stops with real-time information
28. Building and open spaces prepared for climate change
29. Communal composting and food garden
30. Visual attractiveness
31. Certification of buildings and communities
32. Smart city solutions
33. Wayfinding/Signs for pedestrians

**3.3 How would you rate the importance of these strategies for a circular and regenerative use and management of RESOURCES (materials, energy, water)?** (Adapted from/inspired by [4–8])

*5-point Likert scale, + I don't know*

1. Reconvert degraded sites (5-point Likert scale, + I don't know)
2. Adapting/Retrofitting old buildings

3. Increase urban density
4. Multifunctional landscape for water management
5. Permeable pavements
6. Design for deconstruction/disassembly
7. Design for flexible use and adaptation
8. Technical solutions inspired by nature
9. Digital marketplaces for salvaged materials
10. Sharing platforms for tools and things
11. Building Management Systems (BMS)
12. 3D printing of components and buildings (5-point Likert scale, + no idea)
13. Bio-based materials (timber, bioplastics...)
14. Alternative bio-based materials (e.g. plastic made of fungi)
15. Use of non-toxic resources
16. Products with recycled content
17. Replace overused/scarce materials with alternatives
18. Building inventory of materials available
19. Materials passport with environmental information
20. Materials tracing and tracking
21. Open-source design
22. Product upgrade
23. Community gardens for food production
24. District energy/water systems
25. Energy from waste incineration
26. Local renewable energy production
27. Local treatment of wastewater with plants
28. Waste bins in public areas
29. Waste as resource
30. Water self-sufficiency
31. Public areas for composting
32. Shared infrastructure in communities/industrial parks
33. Passive building design
34. Positive energy (more energy than used by the project)
35. Industry/Supply chain collaboration
36. Life cycle analysis (environmental, social, and cost)
37. Local businesses with RC products/services
38. Transparent business practices
39. Self-repair design
40. Product-as-service/Pay-per-use for building components
41. Take-back/Reverse logistics programmes

**3.4 How do you think these aspects of life in the city will change in the following months and years compared to previous years?** (Adapted from/inspired by [9,10])

*For the better | Will remain the same | For the worse*

- The NEED for more public open spaces?
- The USE of public open spaces?
- The design of buildings and houses?

- The possibility of working from home?

**3.5 If you would like to say how, please use this space:**

[_____]

## PERCEPTIONS

**4.1 To what extent do you perceive these items as barriers for the adoption of regenerative and circular practices in the built environment? (1 – no barrier, 5 _ very strong barrier)** (Adapted from/inspired by [11–17])

*Likert-type scale 1 to 5*

- Limited awareness of regenerative and circular practices
- Lack of financial incentives
- Cost of externalities not included in products
- Uncertainties about long-term return of investment
- Lack of enforcing policies and regulations
- Limitation of existing tools (LEED, BREEAM, AQUA, Green Star, etc.)
- Tendering based on lowest price
- Inertia of the construction sector with new approaches
- Lack of market mechanisms for resource recovery in the end of use
- Lack of marketplaces for secondary materials/ resources
- Fragmented supply chain
- Lack of knowledge of what other industries/companies offer as waste that could be resources
- Lack of market ready technologies/solutions
- Uncertainty about effectiveness/benefits of solutions
- Encouraging sustainable lifestyles through design
- lack of redeveloping/retrofitting existing buildings and infrastructure
- Negative perception of higher urban density
- Lack of opportunities/support from the government for public engagement
- Lack of significant ties in the community to establish engagement (low social cohesion)
- Broader socioeconomic challenges that override environmental issues
- Informal urbanism/construction predominance
- Lack of data on building and community performance and operational costs

## PROFESSIONAL PRACTICE

**5.1 In your projects/practices, to what extent do you…** (Adapted from/inspired by [7,8])

Likert-type scale 1 to 5

- implement design for assembly and disassembly?
- specify reused or recycled materials?
- check the environmental information of the products and components you specify/ buy/ use?
- engage with post-occupancy performance assessment?

- engage with your supply chain to develop sustainable solutions?
- engage in projects with net zero aims (zero energy, or zero water, or zero waste)
- include circular or regenerative criteria in specifications or procurement?
- Use/implement Life Cycle Assessment
- Use/implement building or community sustainability certifications as LEED, BREEAM, AQUA, Green Star, etc.?
- Use/implement product sustainability and circular certifications as Cradle to Cradle, Declare, etc.?
- use any database or platform to find reused, recycled, or salvaged materials?
- use any database or platform to identify sustainable or circular materials and systems?

**5.2 If you use any database or platform to find green, sustainable, or regenerative materials and systems, please list them below if you wish.**

[_____]

**5.3 To what extent (on a scale from 0 to 10) do you feel an online platform would be useful in helping you ...??**

- identify regenerative and circular strategies and solutions
- find second hand materials and systems

0_____<*>_____10 (bar)

## CODES AND REGULATIONS

**6.1 Are you aware of any code, laws, regulations, or standards that enforce or promote circular or regenerative practices in your locality?** (Adapted from/inspired by [18,19])

Yes | No

**6.2 If yes in the question above, please list them below if you wish:**

[_____]

**6.3 To what extent (on a scale from 0 to 10) do you agree with the following statements?** (Adapted from/inspired by [19]

- There should be financial incentives to circular and regenerative solutions
- Policies should be developed or updated to foster circularity in the built environment

0_____<*>_____10 (bar)

## ENVIRONMENTAL JUSTICE

**7.1 To what extent should buildings and community planning/design decisions be made 'top-down' by government or private sector organisations, or driven 'bottom-up' by local action?** (Adapted from/inspired by [20–22])

Top down_____balanced_____bottom up (bar)

**46, ghose,**

**7.2 To what extent do you believe the design of urban spaces and buildings…** (Adapted from/inspired by [23–25])

- may have an impact on social inequities and environmental injustice?
- may be a reflection of social inequities and environmental injustice?
- needs to have all society sectors/groups involved and represented?

0_____<*>_____10 (bar)

**7.3 To what extent (on a scale from 0 to 10) do you believe the use of playful, or game-like methodologies could facilitate processes of participatory planning or co-design with...?** (Adapted from/inspired by [26,27])

- communities' residents?
- built environment professionals?
- Urban planning/ architecture students?

0_____<*>_____10 (bar)

**7.4 In a few words, what is your vision about the need to move away from the current industry green/sustainable practices and tools to a circular and regenerative approach?**

[_____]

## PERSONAL AND PROFESSIONAL DEMOGRAPHICS

**8.2 What is your age?**

18-25 | 26-35 | 36-45 | 46-55 | 56-65 | 66+ | prefer not to say

**8.3 What is your gender?**

Female | Male | Prefer not to say | Other (please specify…)

**8.4 In what sector do you work?? In case you have more than one, please select the most relevant.**

- *[REG] Regulator* (policy makers, government at any level, standard developers)
- *[DEV] Public or private developer, landowner, investor*
- *[SUP] Supplier* (supplier, manufacturer, supply chain management)
- *[PRA] Project management*

- *[PRA] Demolition/Deconstruction*
- *[PRA] Builder* (construction companies and related contractors)
- *[PRA] Product/Industrial designer*
- *[PRA] Designer* (architect, urban designer, landscape architect)
- *[PRA] Sustainability/Climate/Environmental Consultant*
- *[PRA] Other practitioners or consultants* (engineers, archaeologists, sociologists, etc.)
- *[U&O] Building/Facilities/Community management*
- *[NGO] Civil Society/NGOs*
- *[ACA] Academia (educators, students, and researchers)*

**8.5 If you would like to be more specific, could you please state your professional role or function?**

[_____]

**8.6 Is your role directly and mainly related with environmental or sustainability issues?**

Yes | No

**8.7 What is the size of the organisation you work for most of your time?**

I am an independent professional | 2-10 people | 11-50 people | 51-100 people | 101-500 people | More than 500 people

**8.8 Does your company operate in more than one country?**

Yes | No

**8.9 What scales/domains of the built environment is your company engaged with? Check all that apply.**

- Product/Components
- Buildings
- Community/Neighbourhood
- City/Region

**8.10 For how many years have you been involved in the built environment industry?**

Less than 2 years | >2-5 years | >5-10 years | >10-15 years | >15-20 years | >20 years

**8.11 And finally, what city and country are you located at?**

[_____]

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