



Edible Cities Network

Edible Cities Network – Integrating Edible City Solutions for social, resilient and sustainably productive Cities

EdiCitNet

Deliverable D5.5

Prioritised indicators and baseline



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Table of Contents

1. EXECUTIVE SUMMARY	4
2. INTRODUCTION.....	5
2.1 Background	5
2.2 Procedure	5
2.2.1 Compilation	5
2.2.2 Prioritisation	5
3. CANDIDATE INDICATORS.....	7
3.1 Initial identification of potential indicators	7
3.2 Rejected indicators	21
4. FEEDBACK ON CANDIDATE INDICATORS FROM THE CITIES	30
4.1 FRC and FC Feedback at the first City Team Meeting	30
4.1.1 Living Lab profiles	30
4.1.2 Economic goals	30
4.1.3 Environmental Goals	30
4.1.4 Social goals	31
4.1.5 Data availability	31
4.1.6 Stakeholders	31
4.1.7 Collectors of monitoring data.....	32
4.1.8 FRC vs. FC perspectives.....	32
4.2 FRC and FC Feedback at the Annual Meeting in Girona	32
4.2.1 Matching indicators to goals	33
4.2.2 Feasibility of methods	34
5. PRIORITISING CANDIDATE INDICATORS FOR THE WP2 SURVEY.....	37
6. FROM CANDIDATE INDICATORS TO THE REAL WORLD.....	41
7. BASELINES.....	48
8. CONCLUSION AND WAY AHEAD.....	49
9. REFERENCE LINKS.....	50
GLOSSARY.....	51

1. Executive Summary

This deliverable briefly introduces the concepts and principles of monitoring and indicators that monitoring is based on. We document the process of selecting indicators for monitoring, showing how a long list of potentially relevant candidate indicators was gradually narrowed down to a few selected indicators that might realistically be monitored in each ECS.

Of an initial list of more than 300 candidate indicators for monitoring, ca. 70 were considered potentially relevant to assess the effects of Edible City Solutions in the project's Living Labs. The list is presented including details such as: indicator names, suggested units for measurement, economic, social and environmental dimensions, and web or literature references. The list of rejected indicators is also presented, since some of these could still be of interest to other cities in the future. We provide an overview of the FRCs' and FCs' feedback as the project has progressed.

This document has provided a basis for dialogue with other work packages and the FRC. When faced with the practicalities of establishing a monitoring system in each FRC, we identified a considerable gap between the academically desirable ambitions for monitoring and what was feasible and desirable for the Cities. Realistically, monitoring must be as simple as possible. Resources are generally not available to employ experts to gather data and it has proven difficult to attract citizen scientists. Qualitative methods are generally preferred over standardised, quantitative measures. The large variation in types of ECS, and their specific goals, makes comparison between ECS difficult. We conclude with preliminary prioritised lists of indicators related to the three FRC that have come furthest in their ECS implementation. In addition, we highlight the indicators included in the WP2 Survey, which aims to gather data from ECS beyond the EdiCitNet Living Labs.

2. INTRODUCTION

2.1 Background

The overall objective of WP5 Documentation and Monitoring is to facilitate following up the performance and effectiveness of ECSs implemented in the FRCs' Living Labs, in relation to their goals.

WP5 started with a literature review to identify indicators that were considered potentially relevant to assess the effects of ECSs in the project's Living Labs. Indicators are measures that reflect status and change and can be used to compare either different places or the same place at different points in time. Indicators are generally used to measure development trends over time. It is therefore important that repeat indicator measurements are done in the same way each time. This would allow the results to provide reliable information about the extent and direction of change. Indicator measurements can be achieved in many different ways. Examples include bio-physical measurements (e.g. temperature), economic measurements (e.g. value of food sold), and measurements of social conditions (e.g. proportion of population with a high level of perceived

well-being).

Depending on the purpose of the information being gathered, monitoring may use quantitative indicators (e.g. number of jobs created, or proportion of people who value visual amenity of ECS) or may use qualitative forms of documentation, such as story-telling by different stakeholders. Different types of information may be useful in different situations, and often a set of several indicators is required to provide a comprehensive understanding of multiple aspects of interest. For that reason, an efficient monitoring of particular measures, such as an ECS, should be based on sets of indicators which together provide a comprehensive picture of how the ECS performs in relation to its aims. In EdiCitNet we expect that different sets of indicators and different forms of documentation will be relevant for different types of ECS and in different city contexts. WP5 aims to help City Teams to find the documentation and monitoring methods that are most suitable for their particular situation.

2.2 Procedure

2.2.1 Compilation

Initially we compiled an extensive list of candidate indicators for monitoring ECS. The list was based on all related literature referred to in the project proposal and supplemented in accordance with suggestions received from project partners during, and subsequent to the project's kick-off meeting in September 2018.

2.2.2 Prioritisation

Prioritisation among candidate indicators was done in different steps and from different perspectives:

- We preliminarily evaluated the suitability of candidate indicators in relation to anticipated ECSs within the EdiCitNet Living Labs ourselves, and the possibility for data collection. We also classified all candidate indicators according to whether they are related to economic, environmental and social aspects of urban sustainability.
- The Living Lab coordinators who had come far enough provided us with feedback on the relevance of the candidate indicators for the ECS in their respective Living Labs.

- The leaders of WP4 provided feedback on the relevance of candidate indicators from the perspective of what they had learned about societal challenges and ECS to be planned in Follower Cities so far.
- The leaders of WP2, who are responsible for developing the EdiCitNet toolbox and online database, provided feedback on the suitability of different indicators for integration into the planned decision support system.
- We arranged a feedback session at the first EdiCitNet City Team Meeting in May 2019. The questions of our interactive survey included economic, environmental and social goals of ECSs as already defined or planned, types of stakeholders to be involved in the ECSs, availability of data, and expected participants in data collection for monitoring. Respondents represented all FRCs which were part of the project at that time (Oslo, Andernach and Rotterdam), two of the Follower Cities, and several research partners and other associated experts.
- We carried out a second questionnaire feedback session at the EdiCitNet Annual Meeting in October 2019. The same three FRCs were represented, six FCs, as well as researchers and experts. The second survey focused on which methods were considered feasible for collecting indicator data.
- The most important work in prioritising the indicators occurred in dialogue with the LL leaders of the FRC, both in monthly WP5 meetings and in separate meetings with each FRC. As each FRC works on finalising their lists of ECSs and completing their implementation plans, we are helping them to select appropriate indicators for each ECS.

3. Candidate indicators

3.1 Initial identification of potential indicators

The indicators in Table 1 are indicators that appear useful for monitoring ECSs. Some may be useful in many situations, others may be relevant only in certain types of ECSs or in a particular context. It is important to eventually select indicators that are relevant to the goals of a particular Living Lab.

We considered many indicators that have been suggested in the literature for monitoring sustainability in cities. Generally, these were not sufficiently relevant to be useful for monitoring ECSs in the Living Labs. Nevertheless, many of the urban sustainability indicators could provide useful information about the neighbourhoods where the ECSs are located. Such neighbourhood profiles could be used to help understand the context of the ECSs and to interpret the indicator values. Socio-economic developments at the level of neighbourhoods may be impacted by a Living Lab in total, but cannot often be linked directly to a singular ECS, since many factors are likely to be involved. Nevertheless, there are certainly relevant issues that cities could be interested in, e.g. signs of gentrification in areas with many ECSs. Potentially relevant indicators include housing affordability, proportion of social housing in the neighbourhood, employment rates and income levels in the neighbourhood, access to play areas, other green infrastructure, health care, public transport, rates of energy consumption, distance to industrial areas, levels of noise or pollution, population density, levels of street lighting, and access to internet, among others. The relevant measures may differ among cities or countries, dependent on their current status and individual challenges. Many factors can indicate the environmental, social and economic conditions in a

neighbourhood. City teams should investigate whether relevant statistics are already being collected. Maps of blue-green infrastructure may also be useful, especially if existing ECSs are included. For existing data to be useful, they must be at a relevant spatial and temporal scale. Even at a coarse scale (e.g., municipal), general statistics may help to interpret and explain trends within an ECS, by providing some context information, e.g. compared to other regions or cities. However, a more detailed spatial scale will be needed (street/neighbourhood/urban district), if the aim is to monitor change in a neighbourhood with ECS, compared with neighbourhoods that do not have ECS, or prior and subsequent to establishment of ECSs within neighbourhoods.

In the same way that a neighbourhood profile can help us to understand the context of an ECS, and whether that context may change over time, user profiles can help us to interpret how participants use and experience an ECS. User profiles may change over time either because the participants change their attitudes and perceptions, or because different people participate. So the length of time using the ECS is also important to include. Background information in user surveys could include questions about age, gender, education attainment, employment status, household economy, access to internet, ethnicity, etc. Care must be taken to respect participants' privacy and avoid causing offence when considering what to include and how to phrase the questions. Questions considered unproblematic in one culture might not be so for others. It may be better to keep answer categories quite broad, rather than risk people not wanting to answer.

Table 1: Candidate indicators initially identified as potentially relevant for monitoring the effectiveness of ECSs in the Living Labs.

ID	Indicator description	Unit of measurement (suggestion)	Specification, incl. adaptation for Edi-CitNet (by WP5 Lead)	Economic	Social	Environmental	Thematic field	Sub-field	Suitable for citizen science	Relevance for FRC Oslo	Relevance for FRC Andernach	Relevance for FC (WP4) by BOKU	Suitability for DSS (WP2) by ICRA & UL	Reference
198	Market sales of ECS produce	monetary value / kg produce	Citizen science: How much is sold at which outlets?	1			Economic opportunities & green jobs	Economic growth for those involved in the ECS	1	High	Low	High	Yes - Needs to be specified/ improved	Five Borough urban farm project toolkit
213	Businesses actively looking for local products	No. of businesses	Extent to which food businesses located in the city region are looking for/selling ECS-products and make the provenance of food visible to customers	1			Economic opportunities & green jobs	Economic growth for those involved in the ECS		High	Medium	High	Yes - Needs to be specified/ improved	RUAF CRFS toolkit
215	Proportion of household income spent on local ECS-produced food	%	Extent that money flows circulate within in the city region food system versus 'leakage' to shareholders outside the city region	1			Economic opportunities & green jobs	Economic growth for those involved in the ECS		Medium	Medium	Medium	Yes - Needs to be specified/ improved	RUAF CRFS toolkit
148	Investments	€/((m ² ·a)	Money spent on ECS? But how to interpret?	1			Economic opportunities & green jobs	Employment in the ECS		Medium-High	Medium	High	Yes - Needs to be specified/ improved	KURAS project
3	Jobs created that are directly linked to ECS	No. of person hours, no. of people employed (full time/50-99%/20-50%/<20%)	no. of jobs created in ECS/LL, both total person hours and no. of people employed.	1			Economic opportunities & green jobs	Employment in the ECS		High	Medium	High	Yes - Needs to be specified/ improved	Eclipse IEF Nature-based solutions

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206	New businesses attracted and additional business rates due to ECS	No. of businesses	New businesses attracted/established by/as ECS	1			Economic opportunities & green jobs	Employment in the ECS			Low	Medium	Lack of information. Not evaluated.	Eclipse IEF Nature-based solutions
85	Proportion/no. of new businesses financially supported	No. of businesses	No. of businesses receiving direct financial benefit from each ECS. And/or support to ECS e.g. from government programmes/subsidies for social work...?	1			Economic opportunities & green jobs	Employment in the ECS	1	High	Medium	High	No	Braulio-Gonzalo et al.
149	Costs of running ECS	€/((m ² ·a)	How will this be interpreted?	1			Resilient economy	Local food		Medium-High	Medium	High	Lack of information. not evaluated	KURAS project
210	Policies and programmes that promote local food production	No. of policies/programs		1			Resilient economy	Local food		Medium	Medium	High	No	RUAF CRFS toolkit
209	Willingness to pay for local products	Monetary value	WTP for ECS-products?	1			Resilient economy	Local food		High	Medium	High	Yes - Needs to be specified/ improved	RUAF CRFS toolkit
199	Donations of food	Y/N / amount/value	Citizen science: Is food from the ECS donated? How/to whom? How much?	1			Resilient economy	Others	1	Low	Medium	Low	No	Five Borough urban farm project toolkit
118	Food growing supplies			1			Resilient economy	Others		Medium-High	Medium	High	Lack of information. not evaluated	Bohn & Viljoen

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117	Training and education	No. of events per yr, no. of person-hours?	Related to ECS...	1			Resilient economy	Others		High	High	High	No	Bohn & Viljoen
20	Being able to participate effectively in political choices that govern one's life ...	No. of connections/qualitative scores from questionnaire	Do municipalities have statistics on no. of people engaging in e.g. planning processes? Are people who participate in ECS more likely to be engaged in other matters that concern their community? (civic engagement)		1		Participatory, Planning & Governance	Civic awareness and engagement	1	Medium	Medium		No	Eclipse IEF Nature-based solutions
204	Cognitive aspects	Degree of trust etc.	Indicators of trust, attachment to neighbourhood, practical help, tolerance and respect		1		Participatory, Planning & Governance	Civic awareness and engagement			Medium		No	Eclipse IEF Nature-based solutions
300	Feeling part of your community	How satisfied are you with feeling a part of your community (0-10, ranging from completely dissatisfied to completely satisfied)			1		Participatory, Planning & Governance	Civic awareness and engagement		Medium-High	Medium	High	Yes - Needs to be specified/ improved	Liveability Indicators Report
299	Membership of local community organisation and decision-making bodies	People who are members of a decision making board or committee (expressed as percentage of the adult population)			1		Participatory, Planning & Governance	Civic awareness and engagement		Medium-High	Medium	Medium	Yes - Needs to be specified/ improved	Liveability Indicators Report
212	Urban gardens/communities ECS of different types	No. and/or area of ECS	No. and/or area of ECS in some broad categories (include indoor, green roofs)		1		Participatory, Planning &	Civic awareness and engagement		Medium	Medium	High	No	RUAF CRFS toolkit

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							Governance							
184	Organisation and governance	0-100	Degree to which business models are defined / management structures established / ECS is self-sustaining (independence) Could also include degree of networking / networks established with other organisations		1		Participatory, Planning & Governance	Civic awareness and engagement		Medium	Medium	High	Lack of information. Not evaluated.	Interreg EU Living Labs, Schumacher 2012
191	Participation	No. of people (or hours spent) by geography, by task, by socio-economic group (e.g. workers, users, visitors)	No. of participants and no. of visits per person - record distance/travel cost per person per trip - record time spent in ECS per visit. Could add background info on education attainment, employment status, household economy, access to internet... See "Participation by geography" video at https://farmingconcrete.org/barn/data-collection-toolkit/ Could survey surrounding neighbouring households ask if they know about the ECS (public awareness). What about tourists (many tourists visit Andernach because of edible city areas)?		1		Participatory, Planning & Governance	Civic awareness and engagement	1	High	High	High	No	Five Borough urban farm project toolkit
302	Volunteering	No. of people who help out as volunteers in ECS	Volunteers helping out at ECS (as a % of total no. involved?) or volunteering to inform about ECS		1		Participatory, Planning & Governance	Civic awareness and engagement		Medium-High	Medium	High	Yes-High	Liveability Indicators Report

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89	Cooperation among administrations and different partners in ECS	No. of workshops held	Ask whether citizens have experienced a) administrative barriers in developing or using their ECS, b) whether they have received help from authorities, if so which and how? E.g. economic help, guidance, training, workshops, other facilitating... // Ask authorities responsible for ECS about the administrative or political barriers and incentives they have encountered		1		Participatory, Planning & Governance	Social networking, fostering collective work	1	Medium	Medium	High	No	Braulio-Gonzalo et al.
92	Development of information material with official data and technical reports	No. of campaigns	Administrative interest in and/or monitoring of ECS		1		Participatory, Planning & Governance	Social networking, fostering collective work		medium - low Relevant measurement?	Medium	High	No	Braulio-Gonzalo et al.
305	Opportunities for community input into planning and governance of ECS	Does the city provide adequate opportunities to get involved in local planning issues?			1		Participatory, Planning & Governance	Social networking, fostering collective work		Medium-High	Medium	High	No	Liveability Indicators Report
298	Opportunities to have a say on important issues	Do you feel there are opportunities to have a real say on issues that are important to you (yes, sometimes, no)			1		Participatory, Planning & Governance	Social networking, fostering collective work		Medium-High	Medium	High	No	Liveability Indicators Report

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307	Participation in arts and cultural activities	People who participated in arts and related activities in the last month (expressed as percentage of the adult population)	Do people consider art an important ingredient in their ECS? (this was mentioned by somebody in Andernach...)		1		Participatory, Planning & Governance	Social networking, fostering collective work		Medium	Low	Medium	No	Liveability Indicators Report
19	Rates of crime, perceptions of safety	No of cases / year, or perceived levels of crime and safety	Police statistics / Ask users to report any crime incidents at or near the ECS. Include question on perceived safety in ECS in citizen questionnaire (perhaps relative to general feeling of safety in the neighbourhood). Hard to tie to ECS if the question has not been asked before ECS start...		1		Public health & well-being	Increasing neighbourhood safety	1	High	Low	Medium	Yes-Medium	Eclipse IEF Nature-based solutions
21	Structural aspects - family and friendship ties	no. of connections/qualitative scores from questionnaire	Include questions in citizen questionnaire e.g. have you made new friends because of the ECS? Do other family members use the ECS? Does the ECS contribute to your social connectedness?		1		Public health & well-being	Increasing neighbourhood safety	1	Medium	Medium	Low	No	Eclipse IEF Nature-based solutions
196	Healthy Eating		Citizen science: Have you changed your diet/eating habits since you started participating in the ECS? (but no way to control the answer) OR ask a random sample of ECS users about frequency/amount of fruit and vegetables eaten and compare with a random sample non-users in the same neighbourhood (but says nothing about cause and effect...) Extent to which residents are equipped with knowledge and skills on safe, diversified and nutritious food and healthy diets		1		Public health & well-being	Raising awareness of health issues	1	High	High	High	No	Five Borough urban farm project toolkit

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23	Increase in no. and percentage of people being physically active (min. 30 min 3 times per week) due to participation in ECS	Days with physical activity (n) due to ECS	Questionnaire, self-reporting of no. of days on which physical activity (of sufficient exertion to raise breathing rate) reached or exceeded 30 min (e.g. over the past 4 weeks).. Would be best before/after starting ECS - problems comparing groups who participate in ECS with those who do not... Could also rely on self-reporting "After starting at the ECS how would you assess your level of physical activity: more / less / about the same".		1		Public health & well-being	Raising awareness of health issues	1	High	High	High	Yes-Medium	Eklipse IEF Nature-based solutions
99	Local food consumption		Amount of food produced in ECS and consumed locally? / Consumption habits		1		Public health & well-being	Raising awareness of health issues	1	High	Medium	High	Yes - Needs to be specified/ improved	Bohn & Viljoen
101	Public health and nutrition		Extent to which ECS-users/ residents of the city region are equipped with knowledge and skills on safe, diversified and nutritious food and healthy diets; possibly replace with several indicators?		1		Public health & well-being	Raising awareness of health issues	1	High	Medium	High	Lack of information. Not evaluated.	Bohn & Viljoen
260	Self-reported health	In general, would you say your health is excellent, very good, good, fair, poor	Among ECS-participants		1		Public health & well-being	Raising awareness of health issues		High	High	High	Yes - Needs to be specified/ improved	Liveability Indicators Report
187	Crop Count, Harvest Count		no. of crops/varieties produced (see overlap with ID 136a), Weight of food harvested https://farmingconcrete.org/barn/data-collection-toolkit/		1		Quality of life perception	Increasing food security	1	Medium-High	High	High	Yes - Needs to be specified/ improved	Five Borough urban farm project toolkit
211	No. of food educational activities		in ECS, or if they can be tied to awareness raising around ECS		1		Quality of life perception	Increasing food security		Medium	Medium	Medium	Yes - Needs to be specified/ improved	RUAF CRFS toolkit

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186	Service creation	0-100	Services created by ECS		1		Quality of life perception	Infrastructures		Medium-High	High		Lack of information. Not evaluated.	Interreg EU Living Labs
16	% of accessible public green space / ECS per capita	m ² /person	Requires definition of "accessible". How far would a person have to travel to participate in an ECS? Maybe only relevant if it can be combined with information on "no. of spare places", i.e. is the "demand" to participate in ECS being fulfilled? (Doesn't matter if there are 3 ECS next to your house if none of them have room for new participants). May require maps of ECS, preferably combined with maps of population density, and economic profiles of inhabitants. Is this data available? Need to ask ECS leaders about present and potential no. of participants		1		Quality of life perception	Leisure		Medium	Medium	High	Yes-Medium	Eclipse IEF Nature-based solutions
17	% of citizens living within a given distance from accessible public green space ECS	% persons within given distance	Similar to ID 16 but starting the analysis from the ECS: Measure e.g. no. of people living within 500 m (neighbourhood) or, more likely, the administrative area (city district), and economic profiles. Can be adapted e.g. distance of ECS from specific user groups. May require maps of ECS, could be combined with maps of population density, and economic profiles of inhabitants. Is this data available?		1		Quality of life perception	Leisure		Medium	Medium	High	Yes-Medium	Eclipse IEF Nature-based solutions
202	Perceptions of citizens on urban nature		Attitudes and perceptions that might be changed by involvement in ECS		1		Quality of life perception	Leisure	1			Medium	No	Eclipse IEF Nature-based solutions
195	Self-reported well-being/ Good Moods in		Citizen science: How do you feel when you arrive, when you are in the ECS, when you leave? How important is the		1		Quality of life	Leisure	1	Medium	High	Medium	No	Five Borough urban farm project toolkit

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	the ECS Garden		ECS for your general feeling of well-being? (we can analyse links to frequency of visits, employment status, feeling of social connectedness etc.)				perception							
13	User values attached to green/blue areas ECS	Qualitative or using subjective scores (or € using contingent valuation, but more complicated to carry out and interpret...)	Mapping of user values attached to ECS, using questionnaires in individual ECS		1		Quality of life perception	Leisure	1	Medium	High	Medium	Lack of information. Not evaluated.	Eclipse IEF Nature-based solutions
125	Visual amenity		Ask citizens using questionnaire in individual ECS. This is one of the "user values attached to ECS", mentioned in ID 13 (either specify an indicator for each "user value" or leave them all in ID 13?)		1		Quality of life perception	Leisure	1	Medium	High	High	No	Bohn & Viljoen
207	Household food self-reliance due to ECS in food consumption	%	Percentage of household food coming from ECS		1		Resilient economy	Local food		Low	Medium	Medium	No	RUAF CRFS toolkit
304	Community acceptance of diverse cultures among ECS participants	people who agree that it is a good thing for society to be made up of people from different cultures	Could monitor within ECS or compare ECS users to general public in the neighbourhood		1		Social justice & cohesion	Bringing the neighbourhood together		Medium-High	Medium	High	No	Liveability Indicators Report
104	Neighbourhood and local identity		Feeling of belonging/identification with local ECS		1		Social justice & cohesion	Bringing the neighbourhood together	1	Medium	Medium	Medium-High	No	Bohn & Viljoen
29	Abandoned buildings	%	Percentage of abandoned buildings (or building area) in the neighbourhood of each ECS - how to define... fixed distance from ECS boundaries? Or the administrative unit that the ECS falls within?		1		Social justice & cohesion	Bringing the neighbourhood together		Medium	Low	Medium	Yes - Needs to be specified/ improved	Braulio-Gonzalo et al.

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30	Land without use	%	Percentage of land without use in the ECS neighbourhood/ or city		1		Social justice & cohesion	Bringing the neighbourhood together		High	Low	High	Lack of information. Not evaluated.	Braulio-Gonzalo et al.
79	Proportion of spaces/no. of events where citizens can co-exist and ECS-participants can meet		Number of ECS/events of relevant types e.g. open days, stalls in town, are the ECS open to the public?		1		Social justice & cohesion	Bringing the neighbourhood together		High	Medium	High	No	Braulio-Gonzalo et al.
194	Changes in Attitude: Yum & Yuck		Measuring attitudes to fruit and vegetables (and potentially attitudes to earthworms, composting food waste, use of water ++)		1		Social justice & cohesion	Education	1	Medium	Medium	High	No	Five Borough urban farm project toolkit
192	Skills & Knowledge		In the ECS, sharing with other ECS, any educational projects for school kids, open days, community awareness raising etc.		1		Social justice & cohesion	Education	1	High	High	High	No	Five Borough urban farm project toolkit
201	Social learning concerning urban ecosystems and their functions				1		Social justice & cohesion	Education				Medium	No	Eklipse IEF Nature-based solutions
103	Ownership and agency		Feeling of ownership in ECS		1		Social justice & cohesion	Raising self-esteem	1	Medium	Medium	High	No	Bohn & Viljoen
325	Shade	Area with tree cover in ECS	Could be relevant in some ECS - increase in edible trees over other crops...			1	Climate adaptation and mitigation	Temperature-lowering measures		Medium	Low	Low	No	
9	Temperature reduction in urban areas ECS	Min. and max. °C / day, or just paired measurements	Reduction of heat island effect of the entire city is the wrong scale (impossible to tie to ECS) but could maybe			1	Climate adaptation	Temperature-lowering measures					Yes-High	Eklipse IEF Nature-based solutions

ID	Indicator description	Unit of measurement (suggestion)	Specification, incl. adaptation for Edi-CitNet (by WPS Lead)	Economic	Social	Environmental	Thematic field	Sub-field	Suitable for citizen science	Relevance for FRC Oslo	Relevance for FRC Andernach	Relevance for FC (WP4) by BOKU	Suitability for DSS (WP2) by ICRA & UL	Reference
	compared with nearby urban area	(inside/outside ECS) at	measure the "microclimate" of the ECS compared with nearby urban area.				and mitigation							
95	Development of information material on environmental matters and ECS	No. of campaigns / possibly outreach, participation	Info to citizens, schools, tourists... Could also be info about the ECS written by others			1	Institutional	Environmental knowledge/awareness		Low	Medium	High	No	Braulio-Gonzalo et al.
68	Proportion of ECS products local materials used in public works administration (e.g. municipally owned canteens)	LCA?	Rather heavily modified from the original, but then might be relevant			1	Institutional	Environmental knowledge/awareness		Medium	Medium	Medium	No	Braulio-Gonzalo et al.
129	Brownfield sites		No. of ECS sites that were converted from brownfields. Suitable if creation of ECS on brownfields is a specific goal for a city. Otherwise not, because it will just reflect the availability of brownfields			1	Institutional	Improving the environmental quality of green spaces		Low	Low	Low	No	Bohn & Viljoen
189	Compost Production	Weight or volume, possibility per area or type of ECS	Compost production, could cover Landfill Waste Diversion, e.g. if ECS use "waste" produced off-site that would otherwise have gone to landfill			1	Institutional	Improving the environmental quality of green spaces	1	Medium-High	High	High	Yes - Needs to be specified/improved	Five Borough urban farm project toolkit
43	Proportion of area used for ECS in relation to the total green surface		Proportion of area used for each (type of) ECS in relation to the total green surface in the city.			1	Institutional	Improving the environmental quality of green spaces		Medium	Medium	High	Yes - Needs to be specified/improved	Braulio-Gonzalo et al.

ID	Indicator description	Unit of measurement (suggestion)	Specification, incl. adaptation for EdiCitNet (by WPS Lead)	Economic	Social	Environmental	Thematic field	Sub-field	Suitable for citizen science	Relevance for FRC Oslo	Relevance for FRC Andernach	Relevance for FC (WP4) by BOKU	Suitability for DSS (WP2) by ICRA & UL	Reference
107	Access to (fresh) food		Contribution of fresh ECS-produced food to participants' diets			1	Resource management	Improve local food quality	1	High	High	High	Yes - Needs to be specified/improved	Bohn & Viljoen
108	Local and organic food		Contribution of local and organic ECS-produced food to participants' diets			1	Resource management	Improve local food quality	1	High	High	High	Yes - Needs to be specified/improved	Bohn & Viljoen
327	Soil health	% of soil area/samples with poor/adequate/good soil health	Can be defined by nutrient measurements, or through measures of soil function e.g. decay rate of plant material (Tea bag index)			1	Resource management	Improving soil quality	1		High			http://www.teatime4science.org/
113	Soil toxicity and remediation		Has soil toxicity been measured in the ECS? Y/N. If Y, proportion of soil samples with unacceptable levels of toxins. Suitable for some ECS. Relevant when growing food in a city context, where soil is used over several years or to check that "home composting" does not introduce contamination.			1	Resource management	Improving soil quality			High	Medium	Yes - Needs to be specified/improved	Bohn & Viljoen
139	Ground water recharge/rates of infiltration	%	Potentially relevant, but how do we measure it? Is there any citizen science way to measure this...?			1	Resource management	Improving water quality		Medium-High	Low	High	No	KURAS project
12	Infiltration capacities	mm/hour	Measure infiltration of water into the soil/vegetation of the ECS and compare with neighbouring sealed surface. (Possibly calculate an estimate based on the soil/vegetation characteristics of the ECS?)			1	Resource management	Improving water quality				dependent on case	Yes-High	Eclipse IEF Nature-based solutions

ID	Indicator description	Unit of measurement (suggestion)	Specification, incl. adaptation for Edi-CitNet (by WPS Lead)	Economic	Social	Environmental	Thematic field	Sub-field	Suitable for citizen science	Relevance for FRC Oslo	Relevance for FRC Andernach	Relevance for FC (WP4) by BOKU	Suitability for DSS (WP2) by ICRA & UL	Reference
190	Rainwater Harvesting	Surface area or volume, possibly volume per area	Litres of rainwater collected per ECS (possibly proportion of irrigation water that is collected rainwater, but this is more demanding to record...)			1	Resource management	Improving water quality	1	Low	Low	Medium	Yes - Needs to be specified/ improved	Five Borough urban farm project toolkit
137	α -Biodiversity (Fauna)		No. of animal observations per ECS site. Could use experts, but more likely citizen science. Most relevant groups could be birds, mammals (bats, foxes, hedgehogs, deer), pollinators (butterflies, bumblebees - to morphological types)			1	Resource management	Increase biodiversity	1	High	Medium	High	Yes - Needs to be specified/ improved	KURAS project
136	α -Biodiversity (Flora)		No. of crops/varieties is covered by ID187. Plant diversity (=weeds!) is not a relevant goal for most ECS, but possible to count no. of "types of weeds" (either botanical survey or, more likely, citizen science, not requiring species knowledge, but counting "ones that look different from each other"). Need to specify how to deal with planted flowers (not edible).			1	Resource management	Increase biodiversity	1	High	High	High	Yes - Needs to be specified/ improved	KURAS project
138	β -Biodiversity (Flora)		This would be biodiversity at the city level - calculated based on the results at the local ECS level (ID 136). Or it could be biodiversity for a specific type of ECS based on results from multiple ECS sites of that type...			1	Resource management	Increase biodiversity				High	Yes - Needs to be specified/ improved	KURAS project
324	Household waste recycling	recyclables and green organics recycled in tonnes per local government area / tons per ECS area?	Do you recycle at home? All, some, No. As a measure of environmental awareness that may increase due to ECS awareness raising			1	Resource management	Waste reduction		Low	Low	Medium	Yes - Needs to be specified/ improved	Liveability Indicators Report

The measures used to summarise information about ECS neighbourhoods and ECS participants are indicators, which can indicate changes over time and can be used to make comparisons among locations. They can also help to interpret whether an ECS is meeting its goals, and perhaps even uncover possible reasons for not reaching goals. They are, nevertheless, unlikely to be the most central “headline indicators” in a Living Lab.

Similarly, some indicators primarily designed for one purpose, may have other purposes in EdiCitNet. An example is the Tea Bag Index, which measures soil health and the effects of climate change on rates of plant decay. This is a globally used indicator of environmental change, with its own internet page where citizen scientists can enter their data:

<http://www.teatime4science.org/>. This indicator was considered potentially appropriate for EdiCitNet, even though the plant decay rate in the soil is unlikely to change within the timeframe of the project. Data generation for the indicator could engage children and teach them about soil and issues of climate change. The fact that “their” data could become part of a global project may increase the indicator’s perceived value for the children and make them feel part of a global community. In such a situation, the indicator would be functioning as a tool to increase social cohesion and environmental awareness, which are commonly more important goals for ECS than physical environmental goals. We chose to maintain such indicators on the candidate list.

3.2 Rejected indicators

Table 2 includes those indicators that we excluded from the initial list of candidates. We include them in this document, together with the reasons for exclusion, because we would like to make them, and our assessment, available to those FRC coordinators who were not ready to comment on the relevance of the indicators before the deadline of this

Deliverable, as well as for other cities looking for information about potential indicators. The work of prioritising indicators in the FRC will continue after the final submission of this Deliverable, as more FRC join the project, the plans for the LL become more settled and the ECS are established.

Table 2: Candidate indicators not recommended to be used for monitoring ECSs in Living Labs.

ID	Indicator description	Reference	Why deleted
1	Economic benefit of reduction of stormwater to be treated in public sewerage system	Eklipse IEF Nature-based solutions	Maybe relevant for some ECS (stormwater retention), but no short-term changes expected and no edible link: other blue/green infrastructure will be at least as important
2	Reduced energy demand for heating and cooling	Eklipse IEF Nature-based solutions	Not possible to measure reliably at appropriate scale to be meaningful in ECS-context
4	Nutrient abatement, abatement of pollutants	Eklipse IEF Nature-based solutions	Hard to measure and not a goal of ECS to catch pollutants
5	Reduced energy demand for heating and cooling	Eklipse IEF Nature-based solutions	Merged with ID2
6	Net carbon sequestration by urban forests ECS (including GHG emissions from maintenance activities)	Eklipse IEF Nature-based solutions	Hard to measure something meaningful (how do you define the system boundaries and what would you compare with?)
7	Annual amount of pollutants captured and removed by vegetation	Eklipse IEF Nature-based solutions	Hard to measure and not a goal of ECS to catch pollutants
8	Increased evapotranspiration	Eklipse IEF Nature-based solutions	Hard to measure and not a specific goal of ECS
10	Heatwave risks	Eklipse IEF Nature-based solutions	Impossible to envisage usefulness in EdiCitNet (wrong scale, impossible to tie to ECS)
11	Temperature	Eklipse IEF Nature-based solutions	Merged with ID9
14	Index of biodiversity	Eklipse IEF Nature-based solutions	Biodiversity is covered more specifically elsewhere
15	Number of users (and public awareness)	Eklipse IEF Nature-based solutions	Merged with ID191
18	The availability and distribution of different types of parks and/or ecosystem services with respect to specific individual or household socioeconomic profiles and landscape design	Eklipse IEF Nature-based solutions	Merged with Ids 17, 191
22	Chronic stress and stress-related diseases as shown in cortisol levels	Eklipse IEF Nature-based solutions	Too costly. Covered by ID195
24	Reduced percentage of obese people and children,	Eklipse IEF Nature-based solutions	Not feasible to link this to effects of ECS.
25	Reduction in overall mortality and increased lifespan	Eklipse IEF Nature-based solutions	Not feasible to link this to effects of ECS.
26	Reduction in number of cardiovascular morbidity and mortality events	Eklipse IEF Nature-based solutions	Not feasible to link this to effects of ECS.
27	Consideration of weather conditions to design the city	Braulio-Gonzalo et al.	Not something that ECS can influence
28	Urbanised area of the municipality	Braulio-Gonzalo et al.	Not sufficiently related to ECS. Too broad scale.
31	Corrected compactness	Braulio-Gonzalo et al.	Not related to ECS.
32	Proportion of residential buildings ECS with integrated economic activities	Braulio-Gonzalo et al.	Not reasonable that economic activity should be a goal for all ECS (and no of ECS jobs is covered by ID3)
33	Proportion of activities in ECS to meet daily needs in the neighbourhood	Braulio-Gonzalo et al.	Vague. Covered more specifically elsewhere
34	Number of urban architectural barriers	Braulio-Gonzalo et al.	Not related to ECS.
35	Proportion of area designed for car parking on roads	Braulio-Gonzalo et al.	Not related to ECS.
36	Proportion of unhealthy housing	Braulio-Gonzalo et al.	Not related to ECS.
37	Distance between home and ECS daily activities (business, schools, health centres)	Braulio-Gonzalo et al.	The ECS relevance is covered by ID17 (potential GIS analyses)
38	Distance to public transport from anywhere in the neighbourhood	Braulio-Gonzalo et al.	Not sufficiently related to ECS
39	Distance to public bicycle network from anywhere in the neighbourhood	Braulio-Gonzalo et al.	Not sufficiently related to ECS
40	Existence of alternative mobility (car sharing, etc.)	Braulio-Gonzalo et al.	Not sufficiently related to ECS
41	Citizen access to ICT information panels on public transport	Braulio-Gonzalo et al.	Not sufficiently related to ECS (can be a background/profile question covered by ID191)
42	Proportion of green spaces housing	Braulio-Gonzalo et al.	Not sufficiently related to ECS

ID	Indicator description	Reference	Why deleted
44	Existence of a conservation plan for natural resources	Braulio-Gonzalo et al.	Not sufficiently related to ECS
45	Proportion of autochthonous vegetation	Braulio-Gonzalo et al.	Not very relevant for ECS. Biodiversity is covered elsewhere
46	Proportion of green roofs based on SEV (2007)	Braulio-Gonzalo et al.	Only relevant if they are ECS, and then they are covered by ID212
47	Proportion of buildings certified by an environmental quality sign. based on US GBC (2009a, 2009b)	Braulio-Gonzalo et al.	Not sufficiently related to ECS
48	Proportion of abandoned or unused buildings that have been renovated	Braulio-Gonzalo et al.	Not sufficiently related to ECS
49	Water consumption per occupant	Braulio-Gonzalo et al.	Not sufficiently related to ECS
50	Electricity consumption per occupant	Braulio-Gonzalo et al.	Not sufficiently related to ECS
51	Proportion of buildings with insulation in the thermal envelope ...	Braulio-Gonzalo et al.	Not sufficiently related to ECS
52	Consideration of the solar orientation in the building design	Braulio-Gonzalo et al.	Not sufficiently related to ECS
53	Balanced ratio of different types of housing	Braulio-Gonzalo et al.	Not sufficiently related to ECS
54	Minimise maintenance and operating costs by selecting appropriate materials and HVAC systems and building services	Braulio-Gonzalo et al.	Not sufficiently related to ECS
55	Tree incorporation to mitigate the effect of sun during summer periods	Braulio-Gonzalo et al.	Not sufficiently related to ECS
56	Consideration of ventilation flows for urban design	Braulio-Gonzalo et al.	Not sufficiently related to ECS
57	Proportion of green space and water surfaces in the area to reduce the rise in surface temperature	Braulio-Gonzalo et al.	Too general. ECS temperature covered elsewhere
58	Proportion of buildings whose energy rating is higher than average (A, B, C)	Braulio-Gonzalo et al.	Not sufficiently related to ECS
59	Proportion of self-sufficiency with renewable energy	Braulio-Gonzalo et al.	Not sufficiently related to ECS
60	Proportion of local energy production in the district based on LB (2010)	Braulio-Gonzalo et al.	Not sufficiently related to ECS
61	Energy consumption per sector based on CGYM (2010)	Braulio-Gonzalo et al.	Not sufficiently related to ECS
62	Proportion of public buildings using water saving techniques (WST)	Braulio-Gonzalo et al.	Not sufficiently related to ECS
63	Proportion of storm water reused	Braulio-Gonzalo et al.	Covered by ID 190: Rainwater Harvesting
64	Using a water purification treatment system employing natural purification mechanisms ...	Braulio-Gonzalo et al.	Not very relevant for ECS (dedicated water purification schemes are usually based on marsh plants...)
65	Carry out inventory of materials used in public work	Braulio-Gonzalo et al.	Not sufficiently related to ECS
66	Proportion of use of materials with environmental certification for public works used in ECS	Braulio-Gonzalo et al.	Can monitor improvement within the ECS, but not monitoring of how ECS improves the city
67	Proportion of reused or recycled materials in public works	Braulio-Gonzalo et al.	Not sufficiently related to ECS
69	Proportion of construction and demolition waste (CDW) treated by an authorised waste manager	Braulio-Gonzalo et al.	Not sufficiently related to ECS
70	Distance from housing to selective garbage containers	Braulio-Gonzalo et al.	Not sufficiently related to ECS
71	Level of soil contamination	Braulio-Gonzalo et al.	Covered by ID113
72	Proportion of population exposed to pollution of NO ₂ above 50µg/m ³ average annual hourly	Braulio-Gonzalo et al.	Not sufficiently related to ECS
73	Level of heavy metals in the water	Braulio-Gonzalo et al.	Covered by ID113 (soil more relevant than water in EdiCitNet context)
74	Proportion of population exposed to noise ratio ≥ 65 dB (A). Based	Braulio-Gonzalo et al.	Not sufficiently related to ECS

ID	Indicator description	Reference	Why deleted
	on housing		
75	100% provision of luminaire street lamps without light pollution based on SEV (2007)	Braulio-Gonzalo et al.	Not sufficiently related to ECS
76	Distance of neighbourhoods to industrial areas	Braulio-Gonzalo et al.	Not sufficiently related to ECS (could be neighbourhood profile info)
77	Proportion of population with low income	Braulio-Gonzalo et al.	Overlap with others
78	Proportion of adopted consultation with citizens	Braulio-Gonzalo et al.	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
80	Proportion of social housing in the neighbourhood	Braulio-Gonzalo et al.	Not sufficiently related to ECS (maybe include in neighbourhood profile)
81	Proportion between energy expenditure and household income	Braulio-Gonzalo et al.	Not sufficiently related to ECS
82	Percentage of truancy	Braulio-Gonzalo et al.	Hard to interpret
83	Proportion of economic activities dedicated to green jobs in the neighbourhood (waste management, local products, etc.)	Braulio-Gonzalo et al.	Covered more specifically by ID3
84	Unemployment rate in the district	Braulio-Gonzalo et al.	
86	Level of qualifications	Braulio-Gonzalo et al.	Not sufficiently related to ECS (can be a profile question covered by ID191)
87	Tourist vitality in the neighbourhood	Braulio-Gonzalo et al.	Not sufficiently related to ECS (relevant aspects covered under ID191 or ID95)
88	Feasibility of investment	Braulio-Gonzalo et al.	Not clear how this relates to ECS
90	Proportion of companies and institutions with an implemented management system. Based on IBEC (2007)	Braulio-Gonzalo et al.	Not related to ECS
91	Integrating Agenda 21 into urban planning	Braulio-Gonzalo et al.	Not related to ECS, too broad
93	Citizens' access to Information and Communication Technology (ICT)	Braulio-Gonzalo et al.	Not sufficiently related to ECS (can be a profile question covered by ID191)
94	Proportion of public expenditure relating to activities for society	Braulio-Gonzalo et al.	Not related to ECS, too broad
96	Incorporating public parking rates into city centres	Braulio-Gonzalo et al.	Not related to ECS
97	Incorporation of discounts and bonuses to use public transport	Braulio-Gonzalo et al.	Not related to ECS
98	Innovation in different aspects of the urban context based on BRE Global (2001a)	Braulio-Gonzalo et al.	Not clear how this relates to ECS
100	Food culture	Bohn & Viljoen	Vague. Covered more specifically elsewhere (e.g. ID196, 99)
102	Sustainable urban lifestyles	Bohn & Viljoen	Too general, relevant aspects covered elsewhere
105	Leisure	Bohn & Viljoen	Vague. Covered more specifically elsewhere
106	Public space	Bohn & Viljoen	Vague. Covered more specifically elsewhere
109	Food miles and end of oil	Bohn & Viljoen	Not related to ECS, too broad, too complicated for us to calculate properly in EdiCitNet
110	Industrialised food production	Bohn & Viljoen	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
111	The ecological footprint of cities	Bohn & Viljoen	Too general and huge
112	Biodiversity	Bohn & Viljoen	Biodiversity is covered more specifically elsewhere
114	Waste management	Bohn & Viljoen	Covered by ID188
115	CO ₂ and other GHG emissions	Bohn & Viljoen	Too general and huge
116	Air and water management	Bohn & Viljoen	Vague. Hard to link to ECS. Water covered more specifically by ID190
119	Employment and income	Bohn & Viljoen	Covered by ID3
120	Local trade and food processing	Bohn & Viljoen	Covered more specifically elsewhere (e.g. ID3)
121	Green(ed) housing	Bohn & Viljoen	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
122	Layered infrastructure	Bohn & Viljoen	Not related to ECS
123	Urban connectivity	Bohn & Viljoen	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
124	Public perception of open space	Bohn & Viljoen	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)

ID	Indicator description	Reference	Why deleted
126	Spatial diversity	Bohn & Viljoen	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
127	Access to nature	Bohn & Viljoen	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
128	Greenbelt and greenfield	Bohn & Viljoen	Not related to ECS, too broad
130	Access to outdoor space	Bohn & Viljoen	Too general. Access to ECS and time spent there are covered elsewhere
131	Einsparung Trink-/Abwasser (Regen)	KURAS project	Covered by ID 190: Rainwater Harvesting
132	Energieeinsparpotenzial Gebäudekühlung	KURAS project	Not related to ECS
133	Freiraumqualität	KURAS project	Covered by ID 13
134	Stadtklima Änderung Tropennächte 2	KURAS project	Too general. ECS temperature covered elsewhere
135	Stadtklima Änderung Hitzestress (UTCI) 2	KURAS project	Too general. ECS temperature covered elsewhere
140	Grundwasser / Bodenpassage Änderung der Zinkkonzentration	KURAS project	Not sufficiently related to ECS
141	Grundwasser / Bodenpassage Änderung der Chloridkonzentration	KURAS project	Not sufficiently related to ECS
142	Reduktion des Regenabflusses	KURAS project	Covered by ID 190: Rainwater Harvesting
143	Reduktion der Abflussspitze	KURAS project	Not sufficiently related to ECS
144	AFS-Rückhalt	KURAS project	Not sufficiently related to ECS
145	Phosphor-Rückhalt	KURAS project	Not sufficiently related to ECS
146	THG-Potential 100 a	KURAS project	Not sufficiently related to ECS, too complicated to do properly, what to compare with?
147	Bedarf fossiler Energien	KURAS project	
150	EU: At-risk-of-poverty rate + Illustrative threshold value	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
151	EU: Relative median poverty risk gap	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
152	EU: S80/S20	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
153	NAT: Healthy life expectancy	EU SOCIAL INDICATORS 2015	Can't link to ECS
154	EU: Early school leavers	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
155	EU: People living in jobless households	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
156	NAT: Projected Total Public Social expenditures	EU SOCIAL INDICATORS 2015	Not related to ECS
157	EU: Median relative income of elderly people	EU SOCIAL INDICATORS 2015	Not related to ECS
158	EU: Aggregate replacement ratio	EU SOCIAL INDICATORS 2015	Not related to ECS
159	NAT: Self reported unmet need for medical care NAT: Care utilisation	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
160	EU: At-risk-of-poverty rate anchored at a fixed moment in time (2004)	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
161	EU: Employment rate of older workers	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
162	EU: In-work poverty risk	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
163	EU: Activity rate	EU SOCIAL INDICATORS 2015	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
164	NAT: Regional disparities – coefficient of variation of employment rates	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
165	NAT: total health expenditure per capita	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
166	GDP growth	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
167	Employment rate, by sex	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
168	Unemployment rate, by sex, and key age groups	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
169	Long term unemployment rate, by sex and key age groups	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
170	Life expectancy at birth and at 65	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)

ID	Indicator description	Reference	Why deleted
171	Old age dependency ratio, current and projected	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
172	Distribution of population by household types, including collective households	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
173	Public debt, current and projected, % of GDP	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
174	Social protection expenditure, current, by function, gross and net (ESPROSS)	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
175	Jobless households by main household types	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
176	Making work pay indicators (unemployment trap, inactivity trap (esp. second earner case), low-wage trap.	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
177	Net income of social assistance recipients as a % of the at-risk of poverty threshold for 3 jobless household types	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
178	At-risk of poverty rate before social transfers (other than pensions), 0-17, 18-64, 65+	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
179	NAT: change in projected theoretical replacement ratio for base case 2004-2050 accompanied with information on type of pension scheme ... and change in projected public pension expenditure 2004-2050	EU SOCIAL INDICATORS 2015	Covered by user profiles, or statistics for the neighbourhood (if available/if interested...)
180	User involvement	Interreg EU Living Labs	Covered by ID191
181	SME Innovation support	Interreg EU Living Labs	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
182	Methods and tools	Interreg EU Living Labs	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
183	Innovation outcomes	Interreg EU Living Labs	Difficult to measure, except as numbers of jobs/businesses/participants, which are covered elsewhere
185	Infrastructure	Interreg EU Living Labs	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
188	Landfill Waste Diversion	Five Borough urban farm project toolkit	Covered by ID189
193	Reach of Programs	Five Borough urban farm project toolkit	Covered by ID191
197	Beauty of the garden	Five Borough urban farm project toolkit	Covered by ID 13 and ID 125
200	Reduction of inundation risk for critical urban infrastructure	Eclipse IEF Nature-based solutions	Not sufficiently related to ECS (even if an ECS could be used in such a situation)
203	Social values for urban ecosystems and biodiversity	Eclipse IEF Nature-based solutions	Vague. Covered more specifically elsewhere
205	Change in mean and median land and property prices	Eclipse IEF Nature-based solutions	Not sufficiently related to ECS (maybe include in neighbourhood profile)
208	Food prices for local vs non-local food	RUAF CRFS toolkit	Value of ECS-food covered by ID216
214	Number of retailers offering "cultural food"	RUAF CRFS toolkit	Not sufficiently related to ECS. Businesses offering ECS-products and household use of ECS-food are covered elsewhere
216	Total value of local ECS-produced food sold	RUAF CRFS toolkit	Covered by ID198
217	perception of personal safety	Liveability Indicators Report	Covered by ID19
218	perception of safety of public places	Liveability Indicators Report	Covered by ID19
219	rates of crime against the person	Liveability Indicators Report	Covered by ID19
220	property crime rates	Liveability Indicators Report	Covered by ID19
221	rates of family violence	Liveability Indicators Report	Hard to link with ECS
222	housing affordability	Liveability Indicators Report	Not sufficiently related to ECS (maybe include in neighbourhood profile)
223	housing affordability	Liveability Indicators Report	Not sufficiently related to ECS (maybe include in neighbourhood profile)

ID	Indicator description	Reference	Why deleted
224	housing affordability	Liveability Indicators Report	Not sufficiently related to ECS (maybe include in neighbourhood profile)
225	public housing provision	Liveability Indicators Report	Not related to ECS
226	population density	Liveability Indicators Report	Not sufficiently related to ECS (maybe include in neighbourhood profile)
227	land use mix	Liveability Indicators Report	Not related to ECS
228	age friendly housing	Liveability Indicators Report	Not related to ECS
229	housing diversity	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
230	reducing noise	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
231	housing related affordability	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
232	housing-related affordability	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
233	housing-related affordability	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
234	access to government primary schools	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
235	access to government primary schools	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
236	access to government secondary schools	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
237	access to government secondary schools	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
238	school walkability	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
239	educational attainment	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
240	educational attainment	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
241	apprenticeships and vocational training enrolments	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
242	school retention	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
243	early childhood education	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
244	academic performance in schools	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
245	destination of school leavers	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
246	destination of school leavers	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
247	destination of school leavers	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
248	access to home internet	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
249	proximity to primary school	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
250	proximity to higher education and training	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
251	long-term unemployment	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
252	unemployment rate	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
253	Employment rate	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
254	income	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
255	income distribution	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
256	variety of jobs	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
257	income level	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
258	access to jobs	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
259	retail business	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
261	Self-reported wellbeing	Liveability Indicators Report	Too broad - merged with ID195 (good mood)
262	general practitioners per population	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
263	distance to medical clinics with a gp	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
264	access to services for older people	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
265	elderly care facilities per population	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
266	public toilets	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)

ID	Indicator description	Reference	Why deleted
267	outdoor public seating	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
268	access to youth and child services	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
269	access to emergency centres	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
270	proximity to childcare	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
271	outdoor public seating	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
272	hospital beds per population	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
273	cycling	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
274	walking	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
275	transport limitation general	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
276	street connectivity walking	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
277	access to public transport	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
278	commute time	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
279	travel mode to work	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
280	road traffic fatalities	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
281	road traffic injuries	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
282	bike racks	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
283	bicycle network connectivity	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
284	perception of stroller accessibility of public transport	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
285	traffic accident rate	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
286	pedestrian accessibility to public transport	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
287	affordability of transport	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
288	traffic noise	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
289	variety of public space	Liveability Indicators Report	Not related to ECS
290	access to play areas	Liveability Indicators Report	Not a goal of ECS (involvement of children covered by ID191)
291	perception of the youth friendliness of open space	Liveability Indicators Report	Not a goal of ECS (involvement of youth covered by ID191)
292	access to play areas	Liveability Indicators Report	Duplicate. Not a goal of ECS (involvement of children covered by ID191)
293	perception of quality of open space	Liveability Indicators Report	Covered by ID13
294	amount of public open space	Liveability Indicators Report	Covered by ID16, 17
295	access to open space	Liveability Indicators Report	Covered by ID16, 17
296	distance to open space	Liveability Indicators Report	Covered by ID16, ID 191
297	frequency of use of public space	Liveability Indicators Report	Covered by ID191
301	social supports	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
303	parental involvement in schools	Liveability Indicators Report	Covered by ID21
306	amount of opportunities to participate in the arts	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
308	culturally appropriate activities	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
309	amount of entertainment venues per population	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
310	amount of sports clubs per population	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
311	food security	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
312	density of fast food restaurants	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
313	density of food outlets	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
314	density of fresh food outlets	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
315	food costs	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)

ID	Indicator description	Reference	Why deleted
316	proximity to healthy food stores	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
317	proximity to healthy food stores	Liveability Indicators Report	Not sufficiently related to ECS (relevant aspects covered more specifically elsewhere)
318	air quality	Liveability Indicators Report	Not sufficiently related to ECS
319	air quality	Liveability Indicators Report	Not sufficiently related to ECS
320	greenhouse gas emissions	Liveability Indicators Report	Not sufficiently related to ECS, too complicated to do properly, what to compare with?
321	household electricity use	Liveability Indicators Report	Not related to ECS
322	renewable gas use	Liveability Indicators Report	Not related to ECS
323	household waste generation	Liveability Indicators Report	Covered by ID188
326	air temperatures		Covered by ID9

4. Feedback on candidate indicators from the Cities

4.1 FRC and FC Feedback at the first City Team Meeting

WP5 arranged a feedback session at the first EdiCitNet City Team Meeting in May 2019. The questions of our interactive survey included economic, environmental and social goals of ECSs as already defined or planned, types of stakeholders to be involved in the ECSs, availability of data, and expected participants in data collection for monitoring. At that time, there were three FRCs in the project: Oslo, Andernach and Rotterdam. All of these were represented in the feedback session, as well as two of the Follower Cities, and several research partners and other associated experts.

4.1.1 Living Lab profiles

All three FRCs foresaw a strong social profile of the ECSs' goals in their Living Lab. One FRC focused almost exclusively on social goals, while the other two mentioned either environmental or economic goals as being important in addition. The two FCs who provided feedback also considered social goals as most important, one of them exclusively, the other together with environmental goals.

4.1.2 Economic goals

One FRC had no economic goals at all for its ECSs, while the other two ticked 3 and 4 of our 5 suggested economic goals, respectively:

- Employment in the ECS (1 FRC)
- Establishment of new businesses/jobs (2)
- Economic growth for those involved in ECS (1)
- Improvement of neglected areas (1)
- Improvement of neighbourhood (2)

Economic goals received the smallest focus in the project's Living Labs.

4.1.3 Environmental Goals

All three FRCs indicated their interest in environmental goals, with 4, 10 and 11 of the 12 suggested goals, respectively:

- Increasing biodiversity (3 FRC)
- Reducing Greenhouse gas emissions of food production (2)
- Reducing energy use of food production (2)
- Temperature lowering measures (1)
- Reducing urban pollution (2)
- Rainwater collection (2)
- Improving water quality (1)
- Improving soil quality (3)
- Waste reduction (2)
- Improving the environmental quality of green spaces (2)
- Environmental knowledge/awareness (3)
- Minimizing use of chemicals on food (2)

Environmental areas thus appeared rather highly prioritised in the project's Living Labs.

4.1.4 Social goals

The FRCs indicated the relevance of 10, 9, and 7 of the 12 suggested social goals of ECSs, in addition to one FRC indicating additional social goals that were not included in our list:

- Civic engagement and awareness (2 FRCs)
- Social networking fostering collective work (3)
- Bringing the neighbourhood together (3)
- Education (3)
- Raising self-esteem (3)
- Improving neighbourhood safety / crime reduction (1)
- Raising awareness of health issue (3)
- Leisure (1)
- Infrastructures (1)
- Increasing food security (2)
- Improving nutritional content of diets (1)
- Including ECSs in strategic urban planning (3)

The social sustainability domain appears to be the highest priority in the Living Labs in total.

4.1.5 Data availability

Representatives of two FRCs knew about certain types of data useful for ECS monitoring available:

- Maps of green infrastructure for the neighbourhood/city (2)
- Statistics of household economics at neighbourhood level (2)
- Local surveys/questionnaires (1)
- Other (1)

Data availability is certainly an issue to be investigated in some more detail prior to finally selecting indicators for an ECS.

4.1.6 Stakeholders

Our survey suggested 10 groups of possible stakeholders to be involved in the Living Labs. All suggestions turned out to be relevant for at least two FRCs. Two FRCs indicated 8, and one FRC indicated 6 of the groups. One FRC indicated incompleteness of the suggestions:

- Administration (3)
- Politicians (2)
- NGOs/Cooperatives (3)
- Children (2)
- Youths (2)
- Immigrants (2)
- Local residents (2)
- Visitors (2)
- Low-income citizens (2)
- Citizens with mental health issues (2)
- Other (1)

Identifying stakeholders is necessary both when considering recording participant profiles and also when thinking about what information different stakeholders may want to receive from monitoring.

4.1.7 Collectors of monitoring data

The three FRC envisaged that they would involve respectively 4, 6 and all (9) of the suggested groups of individuals to participate in data collection for documentation and monitoring:

- City team (3)
- Children (1)
- Youths (2)
- Immigrants (1)
- Local residents (3)
- Visitors/tourists (2)
- Low-income citizens (2)
- Citizens with mental health issues (2)
- University/college students (3)

This is important to consider when deciding on how to record the data for the finally chosen indicators.

4.1.8 FRC vs. FC perspectives

Only representatives of two Follower Cities were present and participated in the survey, in addition to representatives of the scientific leadership of the FCs' WP4. None of the two FCs' representatives indicated the need for any additional economic, environmental or social ECS goals with respect to the ones mentioned in the survey. All economic, environmental and social ECS goals which the representatives from the FCs indicated that their Living Labs will focus on, were also in the focus of at least one FRC. The same applied to all groups of stakeholders envisaged by the two FCs so far, and whom they expect to involve in collecting the data for documentation and monitoring (although only one FC responded to the latter question).

4.2 FRC and FC Feedback at the Annual Meeting in Girona

WP5 arranged a second feedback session at the EdiCitNet Annual Meeting in Girona in October 2019. The same three FRCs, Oslo, Andernach and Rotterdam, were represented as well as six FCs, and several research partners and other associated experts (see Figure 1).

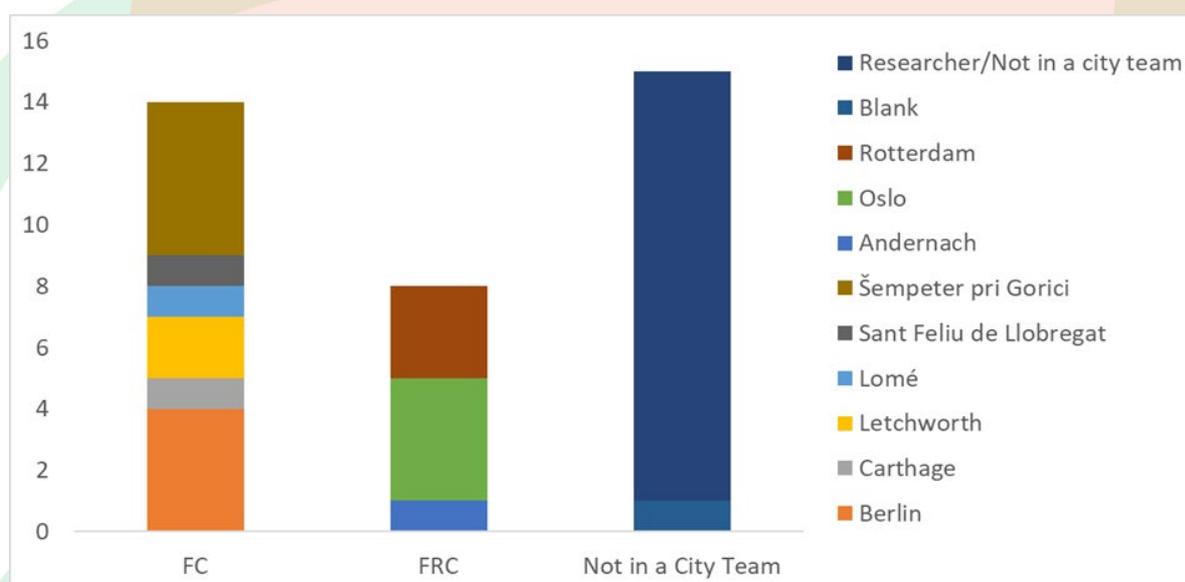


Figure 1: Number and affiliation of people answering the Girona survey

In interpreting the results, it is important to bear in mind that the respondents differed considerably in their degree of involvement in the issues related to monitoring. Some FRC representatives had given feedback on the initial list of indicators from the literature review, had given feedback at the Andernach City Team meeting, and were actively engaged in establishing ECS in their LL and thinking about how to organise monitoring. These people may have already tried to access appropriate data, and therefore have a very accurate knowledge of whether it would be suitable for monitoring or neighbourhood profiling for their specific LL. Others, although associated with an FRC City Team, had not been much involved previously with issues related to monitoring, and their assessment of the feasibility of a method or the availability of data would therefore be less accurate. This variation in levels of appropriate knowledge was probably even greater within the group “Researcher/Not in a City Team”. Respondents also differed in their history with the EdiCitNet proposal, and therefore also their familiarity with the ambitions outlined in the various parts of the Grant Agreement.

4.2.1 Matching indicators to goals

In the EdiCitNet proposal, numerous “measurable impacts” were defined, suggesting that Front-Runner Cities should monitor all aspects of sustainability in their Living Labs. Feedback from the first City Team Meeting revealed, however, that none of the cities represented had goals for all three aspects of sustainability. This picture was confirmed at the Girona meeting, where only Letchworth, out of the nine cities represented, appeared to give equal weight to social, economic and environmental goals. Since the motivation for monitoring is generally to assess progress towards goals, many participants felt that only indicators relating to goals should be selected (Figure 2). Interestingly, there were split opinions also within Cities as to whether monitoring should be carried out for topics not covered by LL goals.

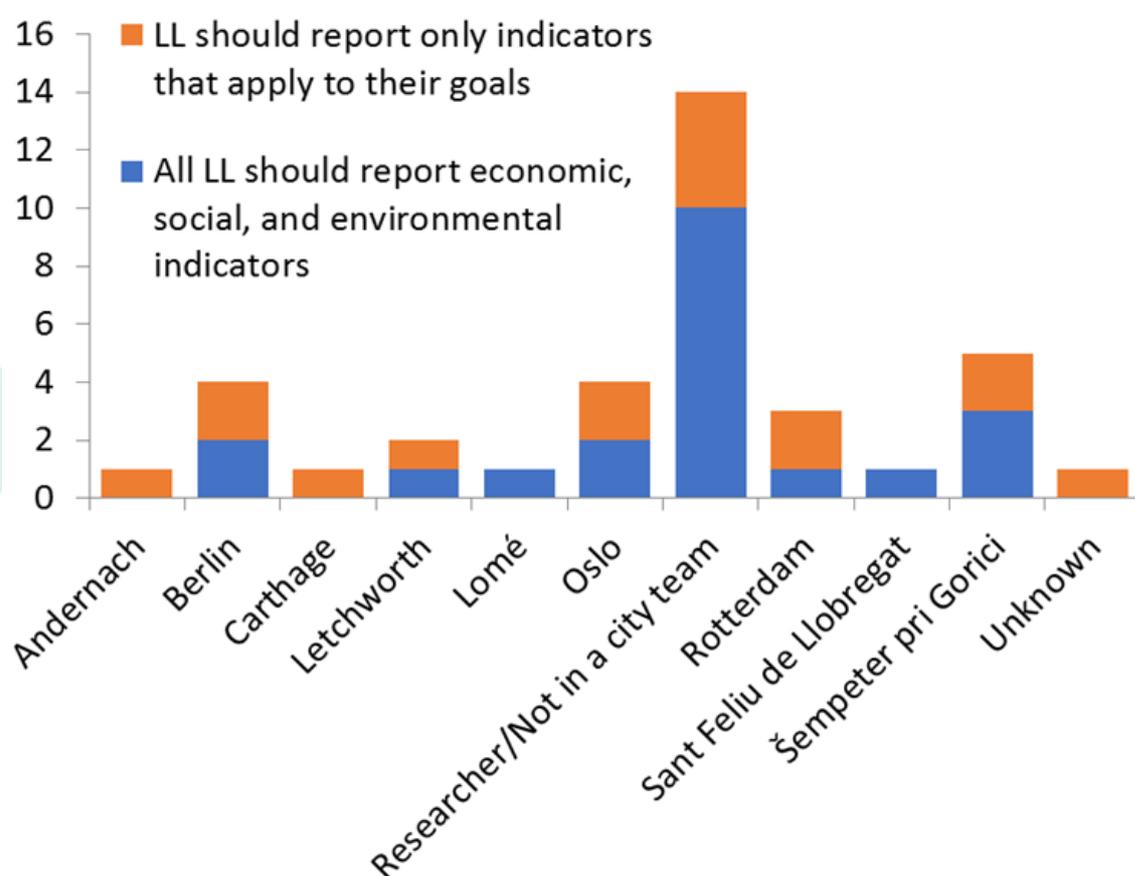


Figure 2: Within all groups, there were split opinions on whether Cities should monitor only indicators that apply to their goals, or all aspects of sustainability.

4.2.2 Feasibility of methods

Based on the indicators found in the literature, and preliminary feedback, we used the survey to ask participants what they considered to be feasible methods for monitoring in their specific LL. We wanted the participants to be as realistic as possible but must take into consideration here the different levels of knowledge amongst participants. For example, people in a City Team might know for certain that public statistics are available for their city, but it might be only those who have actually tried to access these statistics who know that they are not at a relevant temporal or spatial scale to be useful for monitoring the effects of the ECS. Amongst potential economic methods, recording sales of produce, counting new green businesses/jobs and numbers of people employed in ECS were considered the most feasible methods (Figure 3). Figures 4 and 5 show the voting for environmental and social indicators, respectively.

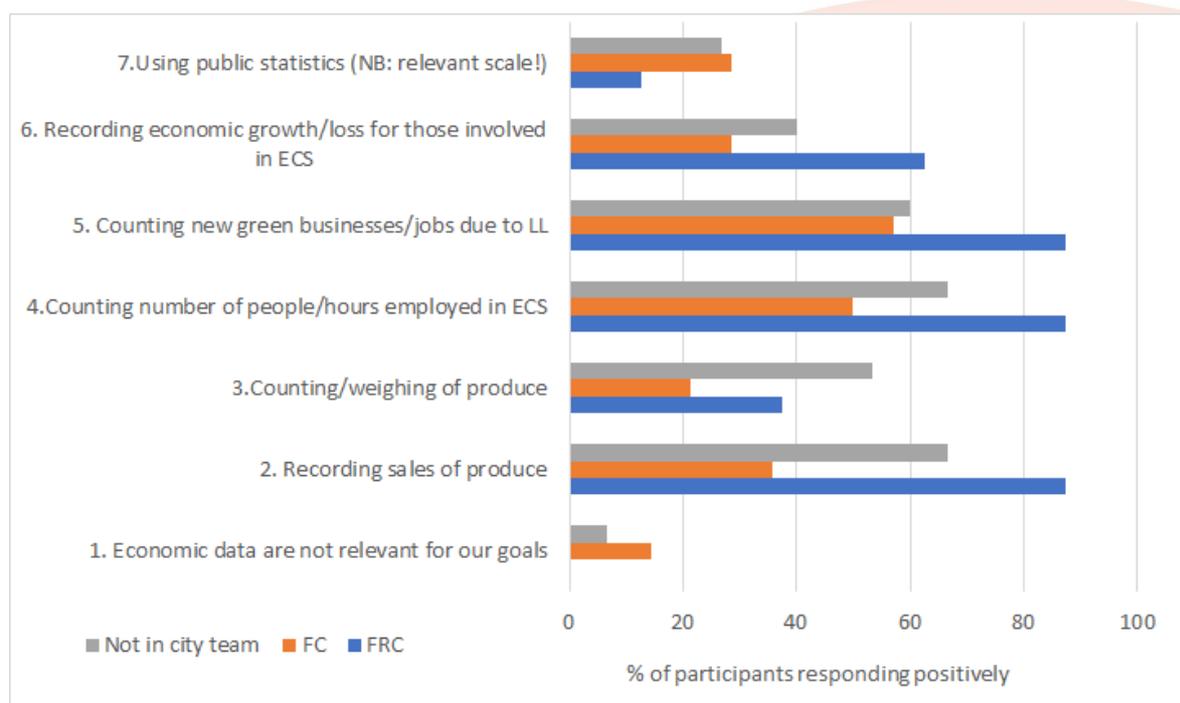


Figure 3: Answers to the question: “What do you consider feasible methods for ECONOMIC data collection in your Living Lab/by stakeholders/by citizens/by you? (please check all that apply)”.

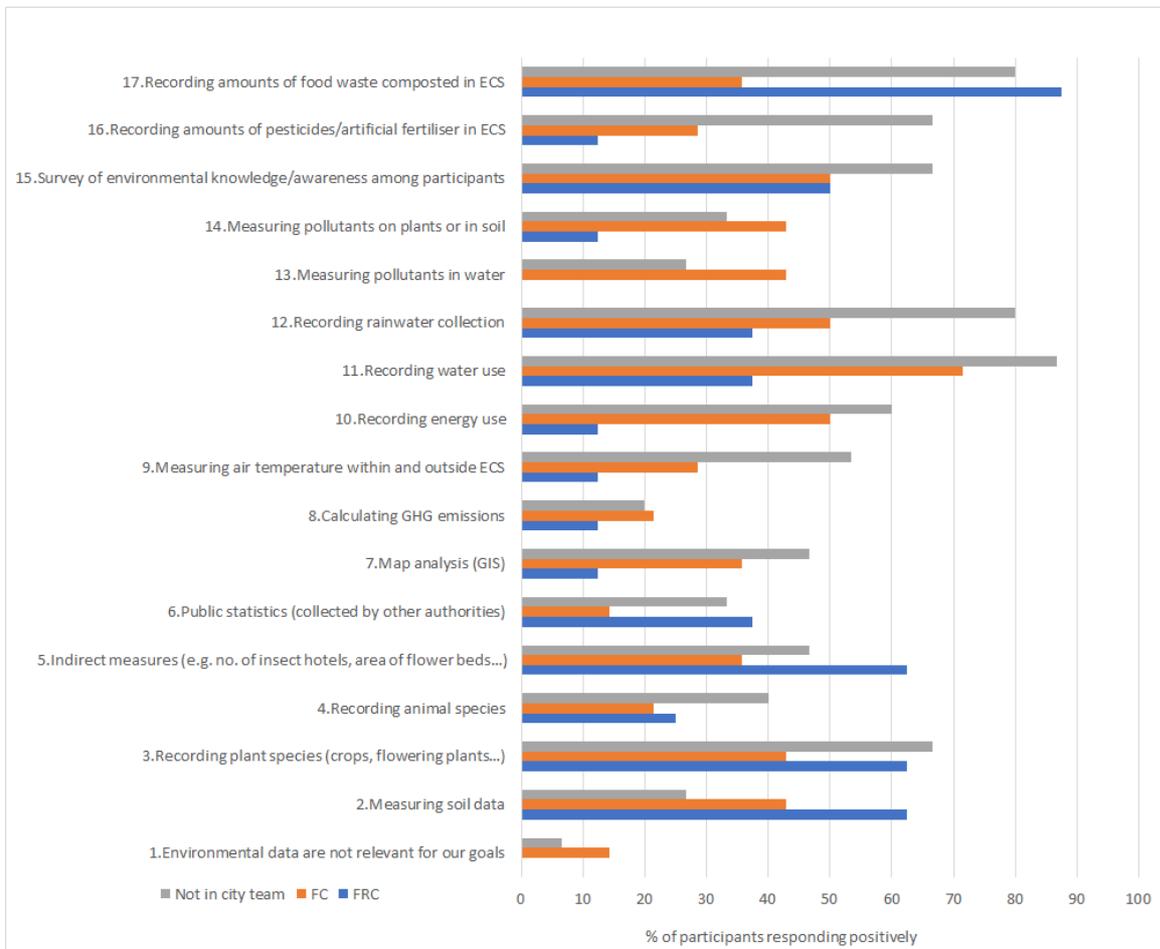


Figure 4: Answers to the question: “What do you consider feasible methods for ENVIRONMENTAL data collection in your Living Lab/by stakeholders/by citizens/by you? (please check all that apply)”. Results are expressed as the percentage of participants in each group who responded positively (of 8 FRC participants, 14 FC participants and 15 researchers/not in city team).

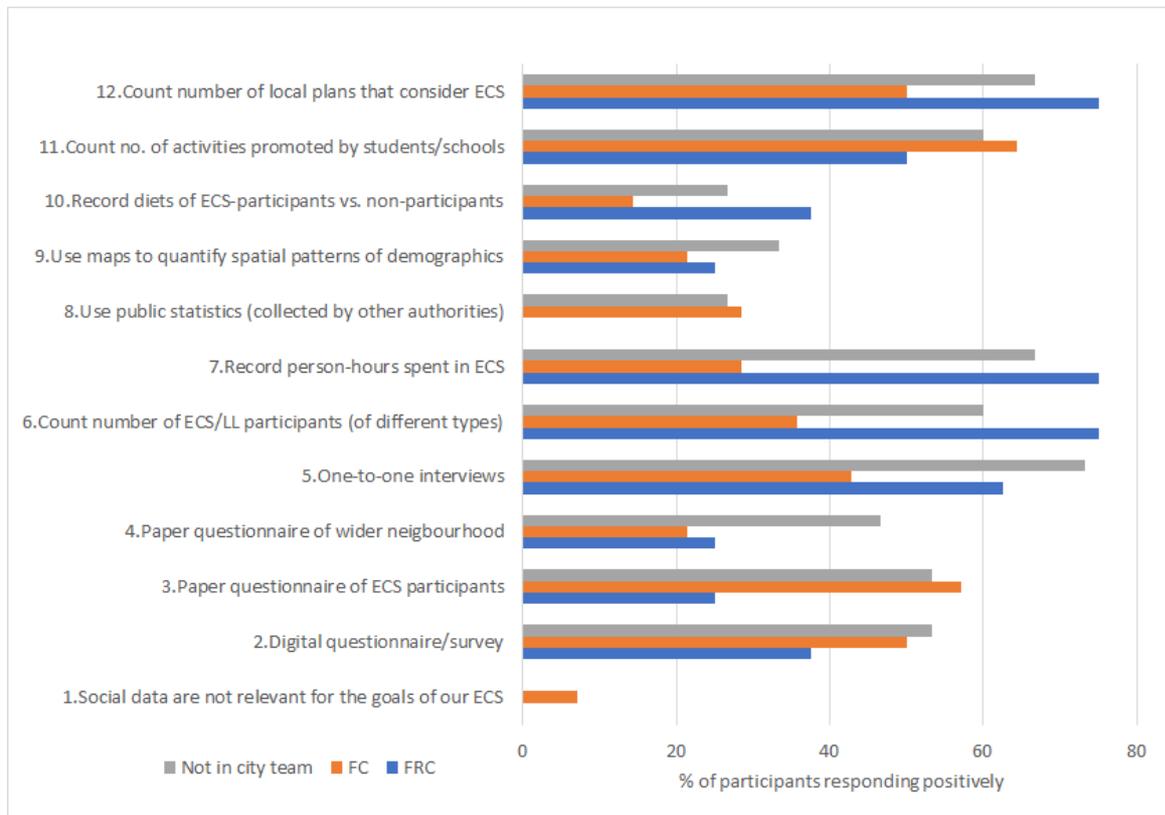


Figure 5: Answers to the question: “What do you consider feasible methods for SOCIAL data collection in your Living Lab/by stakeholders/by citizens/by you? (please check all that apply)”. Results are expressed as the percentage of participants in each group who responded positively (of 8 FRC participants, 14 FC participants and 15 researchers/not in city team).

Across all themes, there seemed to be a pattern that those not involved in city teams had a relatively even assessment of the feasibility of different methods, whilst those who had come furthest in preparing for monitoring in their specific LL (the FRC), distinguished more between the methods, from zero votes (e.g. measuring pollutants in water) to more than 80 % (e.g. recording amounts of waste composted). It should be added, that assessing methods as “feasible” still does not necessarily mean that the cities will use these methods. However, when a method is considered unfeasible it will almost certainly not be considered further.

5. Prioritising candidate indicators for the WP2 Survey

In WP2, as part of the EdiCitNet Toolbox (<https://toolbox.edicitnet.com/>), a survey has been created to gather information not just from the LL within the EdiCitNet project but also from other ECS in these and other cities. By building a long-term database, that will grow over time, the aim is to create a comprehensive catalogue of ECS and to connect ECS activities and outcomes with profiles, such as the types of participants involved, funding sources etc. The toolbox can increase the visibility of the EdiCitNet LL and help to share knowledge, both within the project and with a broad and growing audience beyond the project.

When designing the questions for the survey, WP2 analysed the initial full list of potentially relevant indicators, including the initial

feedback from the cities (Tables 1 and 2). Based on this, numerous indicators were prioritised for inclusion in the WP2 Survey. If many ECS participate, this will enable the comparison of indicators between similar ECS in different cities, or between different types of ECS. This would provide different types of stakeholders with a more comprehensive picture of the different types of ECS available and their effects on social, economic and environmental aspects of sustainability. Considering that the number of ECS and cities within EdiCitNet is relatively small, and the duration of the project limited, the database collected by the WP2 Survey is a more long-term solution for monitoring ECS impacts on sustainability beyond the framework of the project.

Table 3: Indicators addressed in the WP2 Survey.

Prioritized indicators		Related survey questions		Potential raw data to monitor LL
ID	Description	IDs	Question	
43	Proportion of area used for ECS in relation to the total green surface	62 J1_2 C2 75 J1_2 C3 134 2_2 C2	Total area of the ECS (m ²) Area used to grow food (m ²) Area of other green infrastructure (m ²)	% of total area used to grow edible goods Green areas (% of total area)
212	No. and/or area of ECS in some broad categories			
103	Feeling of ownership in ECS	62 J1_2 C4 62 J1_2 C5	Who is/are in charge of running the ECS? Who takes the main decisions?	Indications of changes on ownership and governance
3	Jobs created that are directly linked to ECS	65 J1_2 C1	Select the role in the ECS (employees, volunteers...).	% of female or male employees
191	Participation	65 J1_2 C2	Select the gender	Ratio female/male employees
302	Volunteering	65 J1_2 C3	Please, estimate the number of participants.	% of female or male volunteers Ratio female/male volunteers

Prioritized indicators		Related survey questions		Potential raw data to monitor LL
ID	Description	IDs	Question	
187	Crop Count, Harvest Count	146 J1_2 C1 146 J1_2 C2	Select the products. Estimate the yield.	No. of crops No. of crops per use (donation, commercialisations etc.) Yield per product (kg/year; l/year; units/year) Total yield (kg/year; L/year; units/year)
79 117 192	No. of events where citizens can co-exist Training and education Skills & Knowledge	52 J1_C1 52 J1_C3	Select the type of activity. Estimate the total no. of participants per year.	Total no. of events/year No. of participants/year No. of participants per type of event
85	Proportion/no. of new businesses financially supported	66 J1_2	How is the ECS financed?	% of ECS having different types of funding
149	Costs of running ECS	67 J1_2	Running costs of the ECS Select the type of cost Estimate the respective cost (€/year)	€ spent/type of input * year % of cost per type of input Cost/m ²
189	Compost Production	78 J1_2 C1 78 J1_2 C2 78 J1_2 C3	Select the type of compost/fertiliser. Where was the fertiliser/compost acquired? Please, estimate the amount of the fertilizer/compost, that was used last year (kg/year).	% of fertilizer produced onsite kg of organic or mineral fertilizes used /year
190	Rainwater Harvesting	125 J1_2 81 J1_2 C1C2	If you harvest rainwater, how much was used last year (m ³)? Considering last year, out of the total amount of water used, estimate which proportion was treated wastewater, tap water, harvested rainwater or other sources.	m ³ of harvested rainwater/year % per type of water source
324	Household waste recycling	84 J1_2 86 J1_2	Estimate the proportion (%) of total waste sources at the premises of the ECS (e.g. organic, plastic, paper etc.) that is properly recycled and disposed. Out of the total fresh produce that deviates from what is considered "optimal", for example in terms of shape, size and colour, which proportion (%) is recovered and reused (i.e. commercialisation, donation, processing, feed animals, composting)	% of total waste that is recycled % of food waste that is reused (non-edible or edible uses)

Prioritized indicators		Related survey questions		Potential raw data to monitor LL
ID	Description	IDs	Question	
21	Structural aspects - family and friendship ties	108 J1_4	How do you evaluate the impact of the ECS? Please rate the aspects listed in column 1 from 1 to 7, where 1 stands for no impact and 7 for high impact: <ul style="list-style-type: none"> Facilitating your access to local edible products Increasing your level of physical activity Improving your diet Facilitating the integration of different cultural and social groups 	Average scores per impact Impact Index
23	Self-reported increase of physical activity			
195	Self-reported well-being			
196	Healthy eating			
107	Access to (fresh) food			
108	Contribution of local and organic ECS-produced food to participants' diets			
260	Self-reported health			
304	Community acceptance of diverse cultures			
99	Local food consumption	109 J1_4	Considering last year, out of the total amount of food you consumed, estimate which proportion was local edible products from ECSs (i.e. direct with local agricultures, local markets, local shops)	% of household food coming from ECSs
107	Access to (fresh) food			
108	Contribution of local and organic ECS-produced food to participants' diets			
207	Percentage of household food coming from ECS			
201	Social learning concerning urban ecosystems and their functions	114 j1_4	What is the most important thing you have learned by participating in the ECS? <ul style="list-style-type: none"> Practical and technical knowledge: e.g., how to grow crops or keep animals Practical community knowledge: e.g., how to make decisions together Problems and advantages regarding local urban food Environmental and social knowledge: e.g., around urban ecosystems and their functions Other (specify) 	

Prioritized indicators		Related survey questions		Potential raw data to monitor LL
ID	Description	IDs	Question	
184	Degree of networking / networks established with other organisations	...137 J1_2	Now let's build the ECS network. Add other food related initiative(s) / public or private institution(s) / association(s) that are currently collaborating with the ECS. Select the type of collaboration that is facilitated by this partner.	At city scale: Identify type of actors involved in the edible network; relations between actors and respective contributions At ECS scale: No. of partners, Type of partners, external inputs needed to keep the ECS existing
16 17	Accessibility	J145 J1_2 106 J1_4	Is the access to the ECS public or private? What hinders you from getting more engaged with the ECS? (i.e. the distance from my home; the ECS is not well connected to public transportation)	
198	Profitability analysis (income-expenses)	68 J1_2	What is the net-profit, in %, with respect to what you have spent ((Sales – expenses)/expenses)?	Monitoring of Net profit (%)

6. From candidate indicators to the real world

After the first EdiCitNet Annual Meeting, work on implementing ECS in the FRC continued. Rotterdam left the project and Berlin came in as a replacement FRC. The co-creation process for establishing the LL proved more time-consuming than originally envisaged (see D3.1) and it became very apparent that the ambitions for monitoring outlined in the EdiCitNet proposal, especially the “measurable impacts”, were not realistic. In fact, the monitoring approach would be restricted for several reasons:

- Limited resources
- Limited interest by stakeholders, especially for topics that are not the focus of the LL
- Limited access to data or data collectors
- Difficulties to attract “citizen scientists”

To achieve a more realistic plan for monitoring, and in line with feedback throughout the project, it was decided that the indicators should

focus on the specific goals of each ECS. EdiCitNet is not a pure research project, aiming to conclude on the success or otherwise of ECS. Rather it is an Innovation Action aiming to empower cities and their inhabitants by sharing knowledge and methodologies that will contribute to the long-term success of ECS. Within the project lifespan we will collect only a few years of data. Generally, conclusion about trends and patterns in monitoring data require a much longer timespan and many data points. Thus, it is essential that the cities select indicators that they consider useful and will continue to collect beyond the timeframe of the project. The FRC have therefore been working to define each ECS in their LL and identify the indicators that appear most relevant to their goals. The current status of this work is detailed in Tables 3 to 5.

Table 4: Prioritised indicators currently being considered for monitoring the effectiveness of ECSs in the Oslo Living Lab.

ECS	LL Objective	Related sub-goals	Activities	Economic indicators	Social indicators	Environmental indicators
Community garden	Participation Social inclusion Empowerment	Community development and community engagement through collaboration and participatory methods Job opportunities and knowledge transfer Creating identity and ownership Collaborate with URP and use synergies	Open days, market days, voluntary events, activities for families and kids, planting and harvesting events etc. to engage the community. Participatory planning and building events to create an open and green meeting place for the neighbourhood. Provide possibilities for work training for youth and other vulnerable groups.	Jobs created that are directly linked to ECS (ID 3) Market sales of ECS produce (ID 198)	Participation. No. of people interested; no. of people starting, ... (ID 191) Neighbourhood and local identity (ID 104) Ownership and agency (ID 103) Feeling part of your community (ID 300) Networking / network created (ID 184)	Soil health (ID 327)
CSA	Participation Empowerment	Establish new ECS, create knowledge, closed-loop ECS Facilitate participation for marginalized community members Create a social meeting platform	Establish a CSA with local, motivated community members Sponsor shares for low-income families and organizations with a social focus. CSA as social meeting place through events, activities, knowledge transfer, courses.	Skills and knowledge (ID 192) Jobs created that are directly linked to ECS (ID 3) Market sales of ECS produce (ID 198)	Participation: No. of shareholders, volunteering (ID 191) Neighbourhood and local identity (ID 104) Ownership and agency (ID 103) Feeling part of your community (ID 300)	Soil health (ID 327)

ECS	LL Objective	Related sub-goals	Activities	Economic indicators	Social indicators	Environmental indicators
Test bed (incubator program)	Entrepreneurship Empowerment Participation	Establish new ECS, new businesses Collaboration with existing and new stakeholders to effectively use synergies.	Facilitate infrastructure necessary for an ECS business and provide entrepreneurial knowledge through training and courses (incubator program). Use existing resources and connect to existing distribution networks.	Training and education (ID 117) No. of businesses /ESC established (ID 206) Jobs created that are directly linked to ECS (ID 3) Market sales of ECS produce (ID 198)	Participation. No. of people interested; no. of people starting, ... (ID 191) Ownership and agency (ID 103)	
Composting	Participation Collaboration Entrepreneurship	Closed-loop ECS	Establish different composting techniques Test recycling of spent coffee ground from mushroom production for soil improvement for closed-loop ECS Facilitate knowledge through courses.	No. of businesses/ESC established (ID 206) Market sales of ECS produce (ID 198)	Participation: No. of participants engaged (ID 191)	Soil health (ID 327)
Hay meadow	Collaboration Knowledge transfer	Ensure plant/animal biodiversity Education Entrepreneurship	Establish a wildflower meadow of local native plants by testing different techniques. Provide a platform for education. Product development for possible source of income.	Market sales of ECS produce (ID 198)	Participation (ID 191)	Plant Biodiversity (ID 136) Animal biodiversity (pollinators) (ID 137)
REKO ¹ / Market days	Empowerment Sales channels	Provide access to low-threshold market channels. Use existing resources.	Establish sales through REKO channels and annual market days.	Market sales of ECS produce (ID 198)		

¹ REKO stands for “Fair Consumption” - explanation video of the concept here: <https://www.youtube.com/watch?v=NbsMe4AJZwk>

Table 5: Prioritised indicators currently being considered for monitoring the effectiveness of ECSs in the Andernach Living Lab.

ECS	LL Objective	Related sub-goals	Activities	Economic indicators	Social indicators	Environmental indicators
Crop beds, high beds	Education Recreation	Schools Senior citizens Citizens queuing for garden allotments	Planting Harvesting	Independence (ID 184) Accessibility (ID 16 or 17*)	Participation (ID 191)	Insect monitoring (ID 137) Soil health (ID 327)
Flower meadow	Education	Schools	Sowing Weeding		Participation (ID 191)	Insect monitoring (ID 137)
Action days	Education Recreation	Schools Retirement communities Public citizens	Bed construction Planting Harvesting Cooking	Independence (ID 184) Accessibility (ID 16 or 17*)	Participation (ID 191)	

* ID 16 is the area of ECS accessible to the user group, ID 17 is the proportion of the user group within a defined “accessible” distance from the ECS (could be either a distance or a travel time measure). The measure selected will depend on what data can be made available.

Table 6: Prioritised indicators currently being considered for monitoring the effectiveness of ECSs in the Berlin Living Lab.

ECS ("ingredients" of the LL)	Goals (what you would like to achieve)	Responsibility / Data Collector	Initiatives (activities to be developed in the ECS)	Suggested indicators	Methods
ECS Edible Landscaping (Location: Hellersdorf)	1. Expansion of cultivated area, securing green space for urban food production (desired minimum 900m ²) 2. Increasing opportunities for citizen participation, learning and expression 3. Setting impulses for sustainable development in a neighbourhood in transition 4. Achieving collaboration with housing development corporation	PG / PG PG / participants PG / participant PG / GESOBAU* PG / GESOBAU	1. Develop plant list for edible species (1, 3) 2. Identify specific growing locations together with GESOBAU planners (1, 3) 3. Train gardening volunteers in edible landscaping practices in preparation of planting and develop educational resources (1, 2, 3) 4. Start planting with neighbourhood participation when construction timeline allows it (1, 2, 3) 5. Conduct regular meetings with gardeners to solicit and enable their participation in GESOBAU's planning process (3, 4) 6. Establish regular mode of exchange between PG and GESOBAU for project development (4)	Goal 1.: total planted area (ID 212) Goal 2.: number of participatory events and number of participants (ID 79, ID 191) Goal 3.: number of participants by motivation, by place of (planned) residence (ID 191) Goal 4.: number GESOBAU mentions of the project in GESOBAU publications (ID 95, ID 184) Goal 1, 3 & 4: number of plants from plant list adopted by landscape planners, overall adoption rate of PG / GG suggestions by GESOBAU (ID 136/187)	Measurement Counting Counting and surveying Counting Counting

ECS ("ingredients" of the LL)	Goals (what you would like to achieve)	Responsibility / Data Collector	Initiatives (activities to be developed in the ECS)	Suggested indicators	Methods
<p>ECS Gutsgarten in Transition (Location: Hellersdorf)</p>	<p>1. Re-design of the garden at new location integrating new infrastructure elements, i.e., shop building, kitchen (by Dec. 2021) and multipurpose building (by Dec. 2022)</p> <p>2. Multiplying community benefits from main garden to surrounding neighbourhood (centre -> periphery)</p> <p>3. Developing programming at new location utilizing new infrastructure elements.</p> <p>4. Maintain and ideally increase levels of community participation in the garden especially during the anticipated large-scale construction on the adjacent Gut Hellersdorf</p>	<p>PG / participants</p>	<p>1. Position and build beds, shop building, kitchen, multipurpose building and other infrastructure to new garden area in participation with gardeners, neighbours, etc. (1)</p> <p>2. Develop further regular participatory events in addition to 2x weekly open gardening days (2, 3)</p> <p>3. Put on events like festivals, open-air cinema, readings, exhibits, gardening workshops (2, 3)</p>	<p>Goal 1: Number of functional ECS components established (possibly also effort, time, resources, level of satisfaction) (ID 79)</p> <p>Goal 2: Number of participants by place of (planned) residence and frequency of visits (ID 191)</p> <p>Goal 3: Number of events, number of visitors and number of participants by place of (planned) residence and frequency of visits (ID 79, ID 191)</p> <p>Goal 4: Increase or decrease of regular participants and duration of participation (ID 191)</p>	<p>Counting, combined with storytelling</p> <p>Counting and surveying</p> <p>Counting and surveying</p> <p>Counting</p>

ECS ("ingredients" of the LL)	Goals (what you would like to achieve)	Responsibility / Data Collector	Initiatives (activities to be developed in the ECS)	Suggested indicators	Methods
ECS Product Development (Locations: Hellersdorf & Neukölln)	1. Development of a least one product that can be produced simply and in sufficient quantity using the garden's resources. 2. Development of a brand that serves to connect the two garden sites (Berlin's East & West) and increases awareness for organic / sustainable products 3. Estimate, test and work towards economic viability of product(s)	PG / PG	1. Educating the core team in all aspects of product manufacture, packaging, hygiene, marketing, storage (1,2) 2. Develop feasibility analysis (1,3) 3. Resource assessment in terms of raw ingredients available for processing (1,3) 4. Identify and furnish processing facility (1) 5. Identify distribution channels, partner organization for marketing (2,3) 6. Actual production & marketing of at least one product (1,2)	Goal 1: number of products (possibly amount of product) being marketed (1,2) (ID 187) Goal 2: degree of knowledge about/satisfaction with product (ID 209) Goal 3: economic assessment of product development and production; profitability analysis (income-expenses) (ID 198)	Yes/no Survey of buyers Calculating

* Gesellschaft für sozialen Wohnungsbau (a Berlin-based association for social housing).

7. Baselines

A baseline is the value of an indicator before implementation of interventions or activities. Baselines are used to compare the situation before the activity with monitoring data collected during or after the implementation of the activity. Importantly, baselines must be measured using the same data collection source and methods that will be used in the continued monitoring of the indicator. In practice, this means that the baseline often comprises the first values collected for an indicator. This is the first point in time that it is possible to compare with any subsequent monitoring data. It is very often the case that people would like to compare with an even earlier situation, but unless identical methods have been used, such comparisons will not be valid. In some cases, values of an indicator may be available for a considerable period before the start of the activity and if these data show a general pattern (e.g., increasing or decreasing), this is referred to as a baseline trend. A baseline trend can be valuable to understand data in context and to help set realistic targets.

Clearly, when introducing something entirely new, like an ECS, it can be difficult to measure a “pre-ECS” situation using the same methods that will be used for continued monitoring. For example, participation cannot be measured until there is something to participate in. At this scale, the concept of a baseline is therefore not useful. Monitoring participation is considered useful by all the FRC to look at trends over time and to see whether some ECS attract more participants (or different types of participants) than others, but comparison before the ECS started is not meaningful. For this indicator the first values collected will be those that provide the earliest point of comparison.

At a broader geographic and temporal scale, it would be interesting to measure whether introducing ECS to a neighbourhood increases people’s participation in social activities. This would require surveying a large random sample of people in the neighbourhood (or of a given socio-economic group) before introducing the ECS – to collect the baseline data – and continuing to survey using the same methods after the introduction of the ECS. Realistically, in a

densely populated neighbourhood of a big city like Oslo or Berlin, detecting any effects of ECS in a random survey, would require a large effort, over a long period of time, and is beyond the scope of the EdiCitNet project. The same applies to environmental and economic topics. Establishing any neighbourhood-scale monitoring programmes in order to establish a baseline, before introducing ECS, is too big a task for EdiCitNet. Nor have we found any existing monitoring programmes at the appropriate scale that we could connect with.

One interesting source of information is the European Health Interview Survey (EHIS), which is carried out in all EU-countries and Norway (<https://ec.europa.eu/eurostat/web/micro-data/european-health-interview-survey>). It includes background variables on demography and socio-economic status, health status and health determinants such as activity levels and amount of fruit and vegetables consumed. If some of the same questions were included in an EdiCitNet survey of ECS participants, we could compare the profiles of the participants with the “normal” profile for their county/country. However, this would simply be comparison with another relevant dataset, not comparison with a baseline, because the data collection source (the pool of people being asked the question) would not be the same. Most obviously, the scale of EHIS is very broad (NUTS1). There are several interesting data sets that can be used in this way – for comparison and context – but none that can provide baseline data.

For Follower Cities, whose focus in the EdiCitNet project is more strategic, the consideration of baselines is more relevant than for the FRC, who are already starting their ECS. Would it be possible to influence their cities to establish city-wide monitoring of sustainability in a way that would provide baseline data after future establishment of ECS? By establishing monitoring now, whilst ECS are still relatively rare, cities can establish a baseline for comparison in 10 or 15 years’ time, when ECS have hopefully become more common. This is nevertheless clearly beyond the scope of the monitoring in the LL.

8. Conclusion and way ahead

As this revised Deliverable is submitted, the FRCs are still in the process of organizing and implementing their Living Labs. The revised Implementation Project Plans (D3.1) will be updated once more by 31st August 2021. This revision is then meant to include both final monitoring indicators selected and used by the FRCs, and an overview of data available in each FRC as well.

Much has changed since the draft version of this Deliverable, D5.1, was submitted in May 2019. Now the FRC are much clearer regarding the aims and goals of their Living Labs, the ECS they will use to achieve these goals, and the indicators that it may be feasible to prioritise. The process of reaching this stage has been a learning experience for everybody, involving close collaboration between WP3 and WP5. The FRCs gave constructive feedback on the initial list of candidate indicators, and the various project meetings have been a very helpful platform for WP5 to engage and collect feedback from the FRCs on prioritisation of indicators. Along the way, we have all become more realistic about the type of documentation and monitoring that may be possible for the Cities to achieve. At the time of writing, the exact methods for monitoring are still not decided in many cases. The indicator IDs are being used to show that the topic is a priority, and the next steps will be to describe in detail how these will be reported. In some cases, quantitative measurement may be possible, in other cases qualitative documentation may be considered more realistic or appropriate. In most cases, the concept of pre-ECS baselines is not meaningful and the earliest point of comparison will be the first data values

collected. The process of clarifying the details of monitoring methods will continue through working meetings between the WP5 Lead and each individual FRC, where we discuss each topic, and define exactly what will be recorded, where, when the recording will take place, and who has responsibility. The results of the meetings will be collected in a working document in Teams, with a chapter for each FRC. This will be a 'living' document, where partners can write questions or make suggestions – allowing an ongoing virtual discussion in the document. Points will either be resolved in writing in the document or at the next meeting. By having a single document, the discussions in each FRC will be available for the other FRCs. When topics overlap between cities, we will have joint meetings for two or three FRCs.

Further close dialogue with other partners and scientists in the EdiCitNet consortium will also be essential for the success of WP5. This will also be achieved through focused working meetings. This applies particularly to WP2, with their responsibility for the development of the digital database for the indicators. Clearly, the information gained by the WP2 Survey will be extremely valuable and potentially the main source of indicator data that can be compared across multiple cities.

This Deliverable is therefore not the end of the process of selecting indicators. Rather, it provides a foundation and examples of the process. The WP5 team will continue the dialogue with the FRCs, not only the ones already implementing their Living Labs, but also those that are still about to start their processes, or even FRC that have not formally entered the project yet.

9. Reference links

Bohn & Viljoen

<http://field-journal.org/wp-content/uploads/2016/07/10-The-Edible-City-Katrin-Bohn-and-Andre-Viljoen.pdf>

Braulio-Gonzalo et al.

<https://www.sciencedirect.com/science/article/pii/S0195925515000311>

Eklipse IEF Nature-based solutions

https://ec.europa.eu/research/environment/pdf/renaturing/eklipse_report1_nbs-02022017.pdf

EU Social indicators 2015

<http://ec.europa.eu/social/BlobServlet?docId=3884&langId=en>

Five Borough urban farm project toolkit

<https://farmingconcrete.org/barn/static/resources/DataCollectionToolkit.pdf>

Interreg EU Living Labs

<https://www.interreg-central.eu/Content.Node/Living-Labs.pdf>

KURAS project

http://www.kuras-projekt.de/fileadmin/Dokumenten_Verwaltung/pdf/Steckbriefe_komplett_web.pdf

Liveability Indicators Report

https://socialequity.unimelb.edu.au/_data/assets/pdf_file/0006/1979574/Liveability-Indicators-report.pdf

RUAF CRSF toolkit

<https://www.ruaf.org/sites/default/files/i9255e-CRFS-Indicator-Framework.pdf>

Schumacher J. 2012. Alcotra Innovation Project: Living Labs Definition, Harmonization Cube Indicators & Good Practices - Deliverable 3.1. Alcotra Innovation, Genève, Switzerland.

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Glossary

Abbreviation	Description
ECS	Edible City Solution
FC	Follower City
FRC	Front-Runner City
LL	Living Lab
WP	Work Package

About the EdiCitNet project

EdiCitNet is demonstrating innovative Nature-Based Solutions (NBS). **Edible City Solutions** are going one step further: We include the whole chain of urban food production, distribution and utilisation for **inclusive urban regeneration** and address societal challenges such as mass urbanisation, social inequality and climate change and resource protection in cities. The key components (1) **City Teams**, (2) **Living Labs**, (3) **Masterplans** and the (4) **Edible Cities Network** with *Toolbox* and *Marketplace* form the basic structure of EdiCitNet.



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