

Deliverable D4.2

Data Collection Guidebook



Organisation: Energieinstitut an der JKU Linz

Main authors: Andrea Kollmann, Valerie Rodin

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Envisioning and Testing New Models of Sustainable Energy Cooperation and Services in Industrial Parks

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DELIVERABLE 4.2 – VERSION 1

WORK PACKAGE N° 4

Nature of the deliverable		
R	Document, report (excluding the periodic and final reports)	X
DEM	Demonstrator, pilot, prototype, plan designs	
DEC	Websites, patents filing, press & media actions, videos, etc.	
OTHER	Software, technical diagram, etc.	

Dissemination Level		
PU	Public, fully open, e.g. web	
CO	Confidential, restricted under conditions set out in Model Grant Agreement	X
CI	Classified, information as referred to in Commission Decision 2001/844/EC	

Quality procedure			
Date	Version	Reviewers	Comments
29/10/2018	1	Francesco Peccianti	General comments and additions; alignment of D4.2 with D4.1

Executive summary

This report is part of the deliverables from the project "S-PARCS" which has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 785134. The aim of this report is to specify the calculations of KPIs that were developed as part of S-PARCS' deliverable 4.1 "Methodology and Key Performance Indicators for the monitoring and assessment of the Lighthouse parks". In total 30 KPIs are discussed and assessed with regard to potential calculation approaches.

More information on the project can be found at <http://www.sparcs-h2020.eu/>

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1 Introduction

In order to ensure a consistent framework for the feasibility studies in WP5, WP4 develops the monitoring system which shall be used during and after the testing and optimization phase in WP5. This framework will ensure the comparability of the individual site-specific assessments as well as the replicability of results by ensuring a high generalisability of the outcomes. In addition, all results will be inputs for T3.3 used for fine-tuning the “Initial Assessment Tool (IAT)” as developed in WP3. WP4 will therefore also take care of an effective information flow between all relevant tasks. The framework will also fully take into account the diverse nature of the Lighthouse Park partners (park managers, companies in parks as well as owners of parks), which have different points of views, needs and possibilities. By including all different points of view in the framework definition, the options and strategies, which will be defined in S-PARCS, will take the optimisation goals of all stakeholders into account. The concrete objectives of WP 4 are:

1. *to identify and measure energy consumption in the parks,*
2. *to estimate the impact of energy efficiency measures and joint renewable energy production (self-consumption) on energy demand, and*
3. *to determine the financial impact on companies participating in joint energy services.*

In order to achieve these aims, the first deliverable of WP4, D4.1 “Methodology and Key Performance Indicators for the monitoring and assessment of the Lighthouse parks” was prepared. It proposes a methodology tailored to the evaluation of effects related to the implementation and functioning of one or more (energy cooperation) solutions and aims at obtaining generalized results that can support a broader community of industrial parks for replication in further contexts. The methodology is built upon a selection of Key Performance Indicators (KPIs), which capture a wide variety of potential impacts of the solutions on the parks and allow a comprehensive assessment of performance. A detailed description of the methodology used, the application as well as interpretation of these KPI is given in detail in D4.1.

The aim of this deliverable 4.2 is to specify the KPIs developed in D4.1, propose formulas for quantitative indicators and ways to assess the qualitative indicators. Thereby, D4.2 defines the variables needed either for monitoring the energy consumption, for assessing the solutions’ impact on the operations of the companies, and allowing a judgement of the financial parameters, i.e. all data required for the calculation of the KPIs, but also auxiliary data for allowing the certain process-specific assessments. In the following, the variables and their properties are discussed and a brief overview of factors needed in the processing of the data (recording, storage, sharing, protecting) is given.

For all data processing activities in S-PARCS, a data management plan (D7.1) was prepared which is also the main reference report to be used in the collection of the variables needed for calculating the KPIs.

Data collection is an integral part of the S-PARCS project and the strategies as well as methodologies used will evolve throughout the project’s runtime. Therefore, amendments and/or expansions of the KPIs may become necessary and will be included in amendments to this deliverable.

1.1 Comments concerning interpretation and calculation of qualitative indicators

As is described in greater detail in D4.1, the KPIs that will be discussed in the following are made up of quantitative as well as qualitative indicators, whereby the qualitative indicators are mainly measured on a 5-item Likert scale. In addition, some indicators are binary, i.e. answers are either yes or no. The KPIs for which such measurement is used are:

- O3. Energy efficiency awareness [Likert scale]
- FE6. Marketing & communication opportunities [Likert scale]
- LR1. Simplicity of bureaucracy steps [Likert scale]
- LR2. Legal and Regulatory Feasibility [Likert scale, binary]
- S1. Replication potential [Likert scale]
- S3. Impact on local development [Likert scale]
- S4. Impact on human health and safety [Likert scale]
- S5. Benefits for sustainable mobility [Likert scale, binary]
- T2. Technical Feasibility [Likert scale, binary]
- T3. Annual Uniformity [Likert scale]

For all these KPIs at least one question is asked, to which the respondents answer with a value between 1 and 5, representing their position on the Likert scale. For ease of comparison, the higher the response value, the more positive the answer of the respondent is in all of the above KPIs. Depending on the Likert scale description, “positive” can either mean “easier”, “less costly”, “more beneficial”, “less risky” or others.

All individual responses to the question(s) related to a KPI are collected, summed up and divided by the overall number of questions related to the KPI. Thereby, a single, average value¹ per KPI is derived for the individual respondent. In order to arrive at a single KPI value accounting for all average individual answers, the single, average values of the individuals is summed up and divided by the total number of individuals.

For those KPIs, in which also binary answers are collected, LR2, S5 and T2 specific calculation rules apply. Basically, the answer “yes” is counted as 1 and the answer “no” as 0. But, as these KPIs capture binary answers and Likert scale answers simultaneously, they need to be assessed and interpreted qualitatively. The calculation of averaged values (as done in other qualitative KPIs which will be presented in the following) is not a valid approach here and the overall KPI values for LR2, S5 and T2 will be assessed by qualified expert judgement.

¹ When assessing answers given on a Likert scale using median values is preferable to using mean values. Therefore, “average” value means median value in the following calculation descriptions.

1.2 Variable definition

KPI		O1. Staff involvement [in %]
What is measured	Percentage of staff involved in the implementation of the solution	
Unit	%	
Main data sources	Questionnaires, HR studies for the employees	
Monitoring protocol	Before implementation and every year after implementation	
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company	
Calculation of KPI		
$STAFF_SOL_COMP_t = \sum_{i=1}^l \frac{EMPLOY_SOL_COMP_{i,t}}{EMPLOY_T_COMP_{i,t}} \text{ or } STAFF_SOL_PARK_t = \frac{EMPLOY_SOL_PARK_t}{EMPLOY_T_PARK_t}$ <p>with</p> <p>EMPLOY_SOL_COMP_{i,t} Number of employees involved in the implementation of the solution in company <i>i</i> in time period <i>t</i></p> <p>EMPLOY_T_COMP_{i,t} Number of employees in company <i>i</i> in time period <i>t</i></p> <p>EMPLOY_SOL_PARK_t Number of employees involved in the implementation of the solution in a park in time period <i>t</i></p> <p>EMPLOY_T_PARK_t Number of employees in a park in time period <i>t</i></p> <p><i>i</i> Specific company in a park involved in the implementation of the solution</p> <p><i>l</i> Total number of companies in a park involved in the implementation of the solution</p> <p><i>t</i> Point in time when number of employees is calculated</p>		
Data		
Recording	Number of employees involved in the implementation as well as total number of employees as well as time of counting is recorded by company or park	
Storage	Number of employees involved in the implementation as well as total number of employees as well as time of counting is recorded by company or park	
Sharing	KPI O1. Staff involvement [in %] is shared; underlying numbers need not be shared	
Protection	KPI O1. is only traceable back to an individual if the number of employees in a company or park is small; the specific size needed to ensure anonymity needs to be decided on a case by case decision.	
Definitions		
Employees	a person working for a company for pay; no differentiation is made between types of contracts (e.g. full time, part time); owners of companies are counted as employees for the sake of KPI calculation.	

KPI		O2. Stakeholder involvement [in %]
What is measured	Percentage of stakeholders involved in the implementation of the solution	
Unit	%	
Main data sources	Questionnaires for reference people of the companies, park managers	
Monitoring protocol	Before implementation and when changes are registered	
Level	<input checked="" type="checkbox"/> Park <input type="checkbox"/> Company	
Calculation of KPI		
<p>This KPI calculates the share of companies in a park involved in the implementation of the solution(s).</p> $STAKE_PARK_t = \frac{\sum_{i=1}^I COMP_SOL_{i,t}}{T_COMP_t}$ <p>with</p> <p>COMP_SOL_{i,t} Company <i>i</i> involved in the implementation of the solution in a park in time period <i>t</i></p> <p>T_COMP_t Total number of companies in a park in time period <i>t</i></p> <p><i>i</i> Specific company in a park involved in the implementation of the solution</p> <p><i>I</i> Total number of companies in a park involved in the implementation of the solution</p> <p><i>t</i> Point in time when number of stakeholders is calculated</p>		
Data ...		
... Recording	Number of companies involved in the implementation as well as total number of companies as well as time of counting is recorded by park management or solution implementor(s)	
... Storage	Number of companies involved in the implementation as well as total number of companies as well as time of counting is recorded by park management or solution implementor(s)	
... Sharing	KPI O2. Stakeholder involvement [in %] is shared; underlying numbers need not be shared	
... Protection	KPI O2. is only traceable back to an individual company if the number of companies in a park is small; the specific size needed to ensure anonymity needs to be decided on a case by case decision	
Definitions		
Stakeholder	a company in a specific park involved in the implementation of a solution at time <i>t</i> ; no differentiation is made between types or scale of involvement.	

KPI	O3. Energy efficiency awareness [Likert scale]
What is measured	Effects of the solution on the energy efficiency awareness level of a company or a park
Unit	Measured on a 5-item Likert scale
Main data sources	Questionnaires, interviews for appointed people (park or company level)
Monitoring protocol	Before implementation and every year after implementation
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company
Calculation of KPI	
<p>The levels of awareness of energy efficiency potentials as well as the current status-quo of the companies within the park and/or the park as a whole in relation to energy efficiency are two relevant aspects to be considered before KPI O3. can be effectively evaluated. This necessary overall assessment is not part of this KPI definition, but needs to be considered in the overall design of the final questionnaire.² As part of a questionnaire handed out to either representatives of a company or representatives of the park the following two questions can then be asked:</p> <p>Ex-ante question, to be asked before the implementation of the solution:</p> <p><i>O3a: On a scale from “very high” to “very low or none”: “Please indicate the extent to which you think that the implementation of the solution will increase the awareness about energy efficiency potentials in your company (or park).”</i></p> <p>Ex-post (yearly) question:</p> <p><i>O3b: On a scale form “very high” to “very low or none”: Please indicate the extent to which the implementation of the solution has increased your everyday awareness about energy efficiency potentials in your company (or park).</i></p> <p>O3a. and O3b. are answered by companies in the park and the park manager. Answers have to be collected separately and coded (5 = “very high” to 1 = “Very low or none”). Answers from companies are added up and divided by the total number of companies that provided answers so as to arrive at a single average value for AWARE_COMP_t. Answers from the park management are stored separately as AWARE_PARK_t.</p> $AWARE_COMP_t = \frac{\sum_{i=1}^I AWARE_COMP_{i,t}}{T_COMP_t}$ <p>with</p> <p>AWARE_COMP_{i,t} Likert Scale items (1, ...5) reported by individual company <i>i</i> inside the park in time period <i>t</i>.</p> <p>T_COMP_t Total number of stakeholders from within the park that provided answer to O3a. and/or O3b.</p> <p>AWARE_PARK_t Answer to question as provided by the park manager at time <i>t</i>.</p> <p><i>i</i> Specific company in a park involved in the implementation of the solution</p> <p><i>I</i> Total number of companies in a park involved in the implementation of the solution</p> <p><i>t</i> Point in time when number of employees is calculated</p>	
Interpretation of KPI	
Very high	The solution implies a significant increase in the energy efficiency awareness of the park. The increase is registered both in the daily behaviour of the personnel at work and work-related activities and in the organization of the park and its companies, which show an active commitment in pursuing energy efficiency objectives.
High	The solution implies an increase in the energy efficiency awareness of the park. The

² Therefore, in the final questionnaire, the status quo needs to be evaluated on the company as well as the park level without considering any specific solution. We will rely and build on existing assessments and questionnaires such as the ones developed in the EU funded project EU MERCI <http://jin.ngo/9-news/154-eumerci-questionnaire>.

	increase is registered either in the daily behaviour of the personnel at work and work-related activities or in the organization of the park and its companies, which show a positive attitude towards energy efficiency policies.
Medium	The solution implies a slight increase in the energy efficiency awareness of the park. Staff and managers are aware of issues related to energy efficiency, but only occasionally, behave according to best practices.
Low	The solution leads to minor improvements in the level of energy efficiency awareness and only a few among the staff benefit from the improvements. Companies logistic and organization with respect to energy efficiency strategies is rarely affected by the implementation of the solution.
Very low or none	The solution does not imply any changes in the awareness level of the park, including its staff and companies.
Data	
Recording	Answers are recorded by person responsible for survey/questionnaire
Storage	Answers are stored by person responsible for survey/questionnaire
Sharing	Value of AWARE_COMP _t and AWARE_PARK _t are shared; individual values are not shared.
Protection	No obvious data sensitivity present.
Definitions	
None	

KPI		FE1. Normalized capital expenditure (CAPEX), [in %]
What is measured	The capital expenditure is the amount spent by the park or the companies involved in the implementation of the solution; it is the overall investment necessary for the installation of the solution.	
Unit	%	
Main data sources	Price quotations from manufacturers, installers and suppliers	
Monitoring protocol	Before implementation	
Level	<input checked="" type="checkbox"/> Park <input type="checkbox"/> Company	
Calculation of KPI		
<p>This KPI measures the relation between CAPEX dedicated to solutions regarding energy cooperation (CAPEX_SOL_t) and CAPEX dedicated to all forms of solutions implemented in the park including also energy cooperation solutions (CAPEX_T_PARK_t). CAPEX_SOL_t encompasses all necessary expenditures for the implementation of the solution including all directly attributable costs, from person hours, to material or auxiliary costs, like legal fees. CAPEX is usually provided by the manufacturers and/or installers and/or financing institutes involved.</p> $CAPEX_NORM_t = \frac{CAPEX_SOL_t}{CAPEX_T_PARK_t}$ <p>CAPEX_SOL_t Overall capital expenditures necessary for the implementation of the energy cooperation solution(s) in time period <i>t</i></p> <p>CAPEX_T_PARK_t Overall capital expenditures for all solutions within a park in time period <i>t</i></p> <p><i>t</i> Point in time when number of involved companies is calculated</p>		
Data ...		
... Recording	CAPEX values are provided to the companies or the park implementing the solution by manufacturers, installers, financial institutes or others.	
... Storage	CAPEX values are stored by the companies or park implementing the solution	
... Sharing	Sharing of CAPEX_NORM _t has to be decided case by case to not violate company secrets	
... Protection	CAPEX_NORM _t is per nature sensitive information, whether sharing is possible needs to be decided on a case by case basis.	
Definitions		
None		

KPI		FE2. Normalized net annual balance [in %]
What is measured	Ratio between the annual economic balance related to the implementation of the solution for energy cooperation and the annual economic balance related to the all the solutions (including also energy cooperation solutions) implemented within the park and its companies.	
Unit	%	
Main data sources	Calculation done by stakeholders involved in the solution	
Monitoring protocol	Before implementation and every year after implementation	
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company	
Calculation of KPI		
<p>This KPI measures the ratio between the annual economic balance related to the implementation of the solution for energy cooperation (BALANCE_SOL_t) and the annual economic balance related to all the solutions (including also energy cooperation solutions) implemented within the park and its companies (BALANCE_T_PARK_t).</p> <p>Specifically, the annual economic balance itself is calculated by subtracting annual costs from the sum of annual savings and annual direct incomes.</p> $BALANCE_SOL_t = (SAVINGS_SOL_t + INCOME_SOL_t) - OPEX_SOL_t$ $BALANCE_T_PARK_t = (SAVINGS_T_PARK_t + INCOME_T_PARK_t) - OPEX_T_PARK_t$ $BALANCE_NORM_t = \frac{BALANCE_SOL_t}{BALANCE_T_PARK_t}$ <p>The individual parts of the equations above are defined in the following three tables.</p>		
Data ...		
... Recording	BALANCE_NORM _t is calculated and recorded by the companies involved as well as the park manager	
... Storage	BALANCE_NORM _t is calculated and recorded by the companies involved as well as the park manager	
... Sharing	Sharing of BALANCE_NORM _t has to be decided case by case to not violate company secrets	
... Protection	BALANCE_NORM _t may be considered sensitive information, whether sharing is possible needs to be decided on a case by case basis.	
Definitions		
None		

In order to calculate the KPI FE2. *Normalized Net Annual Balance* the following three subindicators are needed: *FE2a. OPEX*, *FE2b. Annual Savings*, and *FE2c. Annual direct income*. They are defined in the following three tables but are not considered as individual indicators.

KPI		FE2a. Operational & Maintenance (OPEX), [in €/year]
What is measured	OPEX captures the annual expenses for the operation and maintenance of a solution.	
Unit	€/year	
Main data sources	Solution manufacturer(s), suppliers, consulting companies	
Monitoring protocol	Before implementation, every year after implementation	
Level	<input checked="" type="checkbox"/> Park <input type="checkbox"/> Company	
Calculation of KPI		
<p>Having a reliable estimation of OPEX is a highly important factor in the overall decision making process in order to guarantee the economic sustainability of the solution and minimize risk. As with CAPEX, OPEX_SOL_t is provided by the system's manufacturer, by suppliers or consulting companies. Special attention needs to be given to ensure that all relevant costs that may accrue to individual companies within the park are considered. OPEX needs to be re-evaluated on at least a yearly basis. In order to calculate the normalized net annual balance, OPEX_SOL_t is compared with overall OPEX in the park, OPEX_T_PARK_t.</p> <p>OPEX_SOL_t Operational & Maintenance costs of the solution(s) in time period <i>t</i> OPEX_T_PARK_t Operational and Maintenance costs of all solutions implemented in the park in time period <i>t</i> <i>t</i> Point in time when number of involved companies is calculated</p>		
Data ...		
... Recording	OPEX_SOL _t and OPEX_T_PARK _t are provided to the companies or the park implementing the solution by manufacturers, installers, financial institutes or others	
... Storage	OPEX_SOL _t and OPEX_T_PARK _t are stored by the companies or park implementing the solution	
... Sharing	Sharing of OPEX_SOL _t and OPEX_T_PARK _t is not necessary; both subindicators are only needed for the calculation of KPI FE2.	
... Protection	OPEX_SOL _t and OPEX_T_PARK _t are per nature sensitive information and shall remain within the hands of the calculator of KPI FE2.	
Definitions		
None		

KPI		FE2b. Annual savings [in €/year]
What is measured	The annual economic savings gained by the companies involved in the implementation and operation of the solution or the park as a whole	
Unit	€/year	
Main data sources	Stakeholders involved in the implementation and operation of the solution	
Monitoring protocol	Before implementation, every year after implementation	
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company	
Calculation of KPI		
<p>The savings attributable to the implementation and operation of the solution encompass all savings achieved. The achievable savings have to be calculated on a case by case basis and can include avoided purchase of energy from the grid, reduction of staff costs, increases in process efficiency, and reduction of fares for energy, among others. In order to calculate the normalized net annual balance, $SAVINGS_SOL_t$ is compared with overall savings by all solutions implemented in the park, $SAVINGS_T_PARK_t$.</p> <p>$SAVINGS_SOL_t$ Savings gained by the park from the implementation of the solution in time period t</p> <p>$SAVINGS_T_PARK_t$ Overall savings achieved by the companies by all solutions implemented in the park in time period t</p> <p>t Point in time when savings are calculated</p>		
Data ...		
... Recording	$SAVINGS_SOL_t$ and $SAVINGS_T_PARK_t$ are calculated and recorded by the companies involved as well as the park manager.	
... Storage	$SAVINGS_SOL_t$ and $SAVINGS_T_PARK_t$ are calculated and recorded by the companies involved as well as the park manager.	
... Sharing	Sharing of $SAVINGS_SOL_t$ and $SAVINGS_T_PARK_t$ is not necessary; both subindicators are only needed for the calculation of KPI FE2.	
... Protection	$SAVINGS_SOL_t$ and $SAVINGS_T_PARK_t$ are per nature sensitive information and shall remain within the hands of the calculator of KPI FE2.	
Definitions		
None		

KPI		FE2c. Annual direct income [in €/year]
What is measured	The annual direct impact generated by the implementation of the solution	
Unit	€/year	
Main data sources	Stakeholders involved in the implementation and operation of the solution	
Monitoring protocol	Before implementation, every year after implementation	
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company	
Calculation of KPI		
<p>The annual direct income captures all incomes generated by the implementation and operation of the solution ($INCOME_SOL_t$). The generated incomes have to be calculated on a case by case basis and can include selling of electric and thermal energy available in surplus, among others. In order to calculate the normalized net annual balance, $INCOME_SOL_t$ is compared to the sum of all incomes generated in the park in time period t, $INCOME_T_PARK_t$.</p> <p>$INCOME_SOL_t$ Additional income generated by the companies involved in the implementation and operation of the solution as well as the overall park in time period t.</p> <p>$INCOME_T_PARK_t$ Overall additional income generated by the companies involved in the implementation and operation of the solution as well as the overall park in time period t.</p> <p>t Point in time when income is calculated</p>		
Data ...		
... Recording	$INCOME_SOL_t$ and $INCOME_T_PARK_t$ are calculated and recorded by the companies involved as well as the park manager.	
... Storage	$INCOME_SOL_t$ and $INCOME_T_PARK_t$ are calculated and recorded by the companies involved as well as the park manager.	
... Sharing	Sharing of $INCOME_SOL_t$ and $INCOME_T_PARK_t$ is not necessary; both subindicators are only needed for the calculation of KPI FE2.	
... Protection	$INCOME_SOL_t$ and $INCOME_T_PARK_t$ are per nature sensitive information and shall remain within the hands of the calculator of KPI FE2.	
Definitions		
None		

KPI		FE3. Normalized Pay-Back-Period (PBP), [-]	
What is measured	The number of years necessary to recover the total amount of the CAPEX investment for a solution, calculated on the basis of estimated annual savings and direct income generated by the implementation of the solution itself. CAPEX, annual savings and direct income are referred to the entire park.		
Unit	-		
Main data sources	PBP is calculated based on CAPEX, net annual balance information as described above		
Monitoring protocol	Before implementation and every year after implementation		
Level	<input checked="" type="checkbox"/> Park <input type="checkbox"/> Company		
Calculation of KPI			
<p>The calculation of the payback period sets the CAPEX (overall investment needed to implement the solution) in relation to the net annual balance (the difference between financial costs and savings related to the implementation of the solution) and thereby gives an indication about the number of years it will take to recover the original investment. This KPI, PBP_NORM_t captures the relationship between the payback period for the implemented energy cooperation solution (PBP_SOL_t) and the average payback period for all implemented solutions in the industrial park ($PBP_AVG_PARK_t$)</p> $PBP_SOL_t = \frac{CAPEX_SOL_t}{BALANCE_SOL_t}$ $PBP_T_PARK_t = \frac{CAPEX_T_PARK_t}{BALANCE_T_PARK_t}$ $PBP_NORM_t = \frac{PBP_SOL_t}{PBP_T_PARK_t}$ <p> $CAPEX_SOL_t$ and $CAPEX_T_PARK_t$ as defined above $BALANCE_SOL_t$ and $BALANCE_T_PARK_t$ as defined above t Point in time when PBP is calculated </p>			
Data ...			
... Recording	Data is recorded by stakeholder(s) who assess the financial properties of the solution; see also tables above for CAPEX and BALANCE.		
... Storage	Data is stored by stakeholder(s) who assess the financial properties of the solution		
... Sharing	Sensitive information; sharing needs to be discussed on a case by case basis		
... Protection	PBP_SOL_t and $PBP_T_PARK_t$ may be considered sensitive information, whether sharing is possible needs to be decided on a case by case basis.		
Definitions			
None			

KPI		FE5. Financial assistance from public entities [in %]
What is measured	The percentage of CAPEX retrievable from public entities, through funding opportunities and incentives and subsidies	
Unit	%	
Main data sources	Tenders, reports of consulting entities	
Monitoring protocol	Before implementation	
Level	<input checked="" type="checkbox"/> Park <input type="checkbox"/> Company	
Calculation of KPI		
<p>Financial assistance from public entities can come in various forms, from VAT reduction, low interest rate to direct financial contribution and may play a relevant factor in the investment decision-making process. Available financing needs to be found, most likely in cooperation with local/regional governmental institutions and assessed before the implementation of the solution. Also, financial assistance may not only come from local entities, but also from national or European ones.</p> $FINANCE_ASSIST_SOL = \frac{\sum_{a=1}^A FINANCE_ASSISTANCE_a}{CAPEX}$ <p>with FINANCE_ASSIST_SOL Total financial assistance in % of CAPEX FINANCE_ASSIST_a Individual financial assistance a A Sum of individual subsidies, funding and other incentives available</p>		
Data ...		
... Recording	Available funding is recorded by person/institution responsible for the implementation of the solution.	
... Storage	Available funding is recorded by person/institution responsible for the implementation of the solution.	
... Sharing	Sharing of FINANCE_ASSIST_SOL has to be decided case by case to not violate company secrets. As available financing opportunities are public knowledge the type of financial public support used in the implementation of the solution is not subject to data protection.	
... Protection	As available financing opportunities are public knowledge the type of financial public support used in the implementation of the solution is not subject to data protection. The overall amount of public funding may be considered worth protecting, which needs to be decided on a case by case basis and in full compliance with the respective legal system.	
Definitions		
Financial assistance	All types of public financial support including VAT reductions, direct funding, low interest rate credits, research grants, etc. available to reduce CAPEX.	

KPI	FE6. Marketing & communication opportunities [Likert scale]
What is measured	The level of expectation about potential marketing & communication opportunities arising from the implementation of the solution
Unit	Measured on a 5-item Likert scale
Main data sources	Analysis of communication/marketing departments at company or park level
Monitoring protocol	Before implementation and every 3 years after implementation
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company
Calculation of KPI	
<p>The KPI intends to capture an overall impression of the potential marketing & communication opportunities arising from the implementation of the solution. The assessment of these expectations is done by asking companies within the park as well as the park manager a set of questions before the implementation of the solution and every 3 years after the implementation.</p> <p><u>FE6a.: Ex-ante question, to be asked before the implementation of the solution:</u></p> <p>On a 5-item Likert scale from “very high” to “very low or none”:</p> <ol style="list-style-type: none"> 1. How do you rate your expectation about the positive (green) impact of the solution? 2. How do you rate your expectations of the marketing potential? 3. How do you rate your expectations about the solution’s impact on your communication opportunities? 4. How do you rate the solution’s expected potential impact on your advertising and promotion activities? <p>On a 5-item Likert scale from “very long” to “not at all”:</p> <ol style="list-style-type: none"> 5. How long do you expect to be able to exploit this potential? <p><u>FE6b.: Ex-post questions to be asked every three years:</u></p> <p>On a 5-item Likert scale form “very high” to “very low or none”:</p> <ol style="list-style-type: none"> 1. How do you rate the positive (green) impact of the solution? 2. How do you rate the solution’s marketing potential? 3. How do you rate the solution’s impact on your communication opportunities? 4. How do you rate the solution impact on your advertising and promotion activities? <p>On a 5-item Likert scale from “very long” to “not at all”:</p> <ol style="list-style-type: none"> 5. How long do you expect to be able to exploit this potential? <p>FE6a. and FE6b. are answered by different stakeholders in the park. Answers have to be collected separately for companies and the park and coded (5 = “very high” or “very long” to 1 = “Very low or none” or “not at all”). For every set of answers a single, simple average is calculated using to the procedure described in Section 1.1. These averaged answers from companies are added up and divided by the total number of companies that provided answers so as to arrive at a single value for COM_COMP_t. Answers from the park management are stored separately as COM_PARK_t.</p> $COM_COMP_t = \frac{\sum_{i=1}^I COM_COMP_{i,t}}{T_COMP_t}$ <p>with</p> <p>$COM_COMP_{i,t}$ Likert Scale items (1, ...5) reported by individual company i inside the park</p> <p>T_COMP_t Total number of companies that provided answer to FE6a. and/or FE6b.</p> <p>i Specific company in a park involved in the implementation of the solution</p> <p>I Total number of companies in a park involved in the implementation of the solution</p> <p>t Point in time when data is collected</p> <p><u>Interpretation of KPI</u></p> <p>Very high The solution generates significant and valuable marketing communication and opportunities. It is used to support advertising and promotion activities and to develop green marketing initiatives. Benefits from the initiatives are expected both in the short and long term horizon.</p>	

High	The solution generates significant and valuable marketing communication and opportunities. It is used to support advertising and promotion activities and to develop green marketing initiatives. Benefits from the initiatives are expected both in the medium/short term horizon.
Medium	The solution generates small-scale marketing and communication opportunities. It may be used to support advertising and promotion activities and to develop green marketing initiatives. Benefits of these activities are still unknown/unforeseeable.
Low	The solution generates minor marketing and communication opportunities. Benefits of these activities are still unknown/unforeseeable.
Very low or none	The solution does not generate marketing communication and opportunities.
Data ...	
... Recording	Answers are recorded by person responsible for survey/questionnaire
... Storage	Answers are stored by person responsible for survey/questionnaire
... Sharing	Value of COM_COMP_t and COM_PARK_t are shared; individual values are not shared.
... Protection	No obvious data sensitivity present.
Definitions	
None	

KPI	LR1. Simplicity of bureaucracy steps [Likert scale]
What is measured	The level of expectation about the simplicity of bureaucracy related steps in the implementation of the solution.
Unit	Measured on a 5-item Likert Scale
Main data sources	Analysis of administrative departments at company or park level
Monitoring protocol	Before implementation and every 6 years after implementation
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company
Calculation of KPI	
<p>The KPI intends to capture the overall expectation about the bureaucracy related efforts needed for the implementation of the solution. The assessment of the expectation is done by asking companies within the park as well as the park manager the following question.</p> <p><u>LR1a. Ex-ante question, to be asked before the implementation of the solution:</u> On a scale from “1=very high” to “5=very low or none”:</p> <ol style="list-style-type: none"> 1. How do you rate your expectations concerning the effort for the bureaucratic procedure needed to implement the solution? 2. How do you rate your expectations concerning the costs related to the bureaucratic procedures needed to implement the solution? <p>On a scale from “1=not sustainable at all” to “5=very sustainable”</p> <ol style="list-style-type: none"> 3. How do you rate the sustainability of these expected costs for your company/park? <p><u>LR1b. Ex-post (yearly) question:</u> On a scale form “1=very high” to “5=very low or none”:</p> <ol style="list-style-type: none"> 1. How do you rate the effort for the bureaucratic procedure that was needed to implement the solution? 2. How do you rate the costs related to the bureaucratic procedure that were needed for the implementation of the solution? <p>LR1a. and LR1b. are answered by different stakeholders in the park. Answers have to be collected separately for companies and the park and coded (5 = “Very low or none” to 1 = “very high” or 5=“very sustainable” to 1=“not sustainable at all”). For every set of answers a single averaged value is calculated using the procedure described in Section 1.1. These averaged answers from companies are added up and divided by the total number of companies that provided answers so as to arrive at a single value for BUREAU_COMP_t. Answers from the park management are stored separately as BUREAU_PARK_t.</p> $BUREAU_COMP_t = \frac{\sum_{i=1}^I BUREAU_COMP_{i,t}}{T_COMP_t}$ <p>with</p> <p>BUREAU_COMP_{i,t} Likert Scale items (1, ...5) reported by individual company <i>i</i> inside the park</p> <p>T_COMP_t Total number of companies that provided answer to LR1a. and/or LR1b.</p> <p><i>i</i> Specific company in a park involved in the implementation of the solution</p> <p><i>I</i> Total number of companies in a park involved in the implementation of the solution</p> <p><i>t</i> Point in time when data is collected</p>	
<u>Interpretation of KPI</u>	
Very low or none	Only a few minor and common bureaucratic steps are necessary and procedures are already known to the administrative offices of the park or its companies. Costs and time constraints are sustainable by the park with minimum effort.
Low	A few bureaucratic steps are necessary and procedures are already known to the administrative offices of the park or its companies. Costs or/and time constraints can be sustained with suitable planning, but obstacles are not foreseen.
Medium	Some bureaucratic steps are necessary and a few of them are not known by the administrative offices of the park or its companies. Nevertheless, no major obstacles in terms of costs and time are foreseen for the implementation of the installation.

High	Some bureaucratic steps are necessary and most of them are not known by the administrative offices of the park or its companies. Obstacles in terms of costs and/or time may arise during the procedures.
Very high	A significant number of bureaucratic steps is necessary and most of them are not known by the administrative offices of the park or its offices. Likely, obstacles in terms of costs and/or time will arise during the procedures.
Data ...	
... Recording	Answers are recorded by person responsible for survey/questionnaire
... Storage	Answers are stored by person responsible for survey/questionnaire
... Sharing	Value of BUREAU_COMP _t and BUREAU_PARK _t are shared; individual values are not shared.
... Protection	No obvious data sensitivity present.
Definitions	
Bureaucracy related efforts	All measures that need to be taken to comply with requirements imposed by the public administrative on a local, regional, national and / or European level.

KPI		LR2. Legal and Regulatory Feasibility [Likert scale, binary]										
What is measured	The level of expectation about the feasibility of the implementation of the solution from a legal and regulatory perspective.											
Unit	Measured on a 5-item Likert Scale, binary answers											
Main data sources	Analysis of administrative departments at company or park level											
Monitoring protocol	Before implementation											
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company											
Calculation of KPI												
<p>The KPI intends to capture the overall expectation about the feasibility of the implementation of the solution from a legal and regulatory perspective. It focuses on the number as well as type of agreements and contracts (within and outside the park's boundaries) needed to be able to and to be allowed to implement the solution. As this KPI will differ significantly between parks, companies and the solution chosen, it is assessed here by asking companies within the park as well as the park manager the following, qualitative questions.</p> <p><u>LR2. Ex-ante question, to be asked before the implementation of the solution:</u></p> <p>With 1= yes, and 0=no:</p> <ol style="list-style-type: none"> 1. Do you expect to sign new contractual agreements to deploy the solution? <ul style="list-style-type: none"> • 1a) if no: Do you expect to update existing contractual agreements? <ul style="list-style-type: none"> ○ If yes: Do you expect restrictions and obstacles due to these contracts? ○ If no: On a scale from 1="very difficult" to 5="not difficult at all", please indicate your expectation of the difficulty to overcome the identified obstacles. • 1b: if yes: Are these contracts standard contracts? <ul style="list-style-type: none"> ○ If yes: Do you expect difficulties in this procedure? ○ If no: On a scale from 1="very difficult" to 5="not difficult at all", please indicate your expectation of the difficulty to overcome the identified obstacles. <p>LR2 is answered by different stakeholders in the park. Answers have to be collected separately for companies and the park and coded.</p> <p>As this KPI captures binary answers and Likert scale answers simultaneously, it needs to be qualitatively assessed and interpreted. The calculation of averaged values (as done in other qualitative KPIs) is not a valid approach here. Having collected the answers to the set of questions presented above, the binary results and the Likert scale results will be presented separately and the overall KPI value will be assessed by expert judgement.</p> <p><u>Interpretation of KPI</u></p> <table border="0"> <tr> <td>Very high</td> <td>No further contract or agreement is stipulated for the solution. Existing agreements and contracts may be updated.</td> </tr> <tr> <td>High</td> <td>A limited number of contracts and agreements is stipulated for the solution, and mainly between the companies within the park. Contracts and agreements with external entities are ordinary types of contracts, which do not require effort from the park or its companies.</td> </tr> <tr> <td>Medium</td> <td>Few contracts and agreements are stipulated, both between the companies of the park and between the companies of the park and external entities. No major obstacle is foreseen for the stipulation.</td> </tr> <tr> <td>Low</td> <td>A relevant number of contracts and agreements is stipulated, both between the companies of the park and between the companies of the park and external entities. Significant restrictions may be imposed and obstacles may arise during stipulation and during the duration of the contract.</td> </tr> <tr> <td>Very low or none</td> <td>A relevant number of contracts and agreements is stipulated, both between the companies of the park and between the companies of the park and external entities. Significant restrictions are imposed and obstacles will likely arise during stipulation and during the duration of the contracts.</td> </tr> </table>			Very high	No further contract or agreement is stipulated for the solution. Existing agreements and contracts may be updated.	High	A limited number of contracts and agreements is stipulated for the solution, and mainly between the companies within the park. Contracts and agreements with external entities are ordinary types of contracts, which do not require effort from the park or its companies.	Medium	Few contracts and agreements are stipulated, both between the companies of the park and between the companies of the park and external entities. No major obstacle is foreseen for the stipulation.	Low	A relevant number of contracts and agreements is stipulated, both between the companies of the park and between the companies of the park and external entities. Significant restrictions may be imposed and obstacles may arise during stipulation and during the duration of the contract.	Very low or none	A relevant number of contracts and agreements is stipulated, both between the companies of the park and between the companies of the park and external entities. Significant restrictions are imposed and obstacles will likely arise during stipulation and during the duration of the contracts.
Very high	No further contract or agreement is stipulated for the solution. Existing agreements and contracts may be updated.											
High	A limited number of contracts and agreements is stipulated for the solution, and mainly between the companies within the park. Contracts and agreements with external entities are ordinary types of contracts, which do not require effort from the park or its companies.											
Medium	Few contracts and agreements are stipulated, both between the companies of the park and between the companies of the park and external entities. No major obstacle is foreseen for the stipulation.											
Low	A relevant number of contracts and agreements is stipulated, both between the companies of the park and between the companies of the park and external entities. Significant restrictions may be imposed and obstacles may arise during stipulation and during the duration of the contract.											
Very low or none	A relevant number of contracts and agreements is stipulated, both between the companies of the park and between the companies of the park and external entities. Significant restrictions are imposed and obstacles will likely arise during stipulation and during the duration of the contracts.											
Data ...												
... Recording	Answers are recorded by person responsible for survey/questionnaire											

... Storage	Answers are stored by person responsible for survey/questionnaire
... Sharing	Value of LEGAL_COMP _t and LEGAL_PARK _t are shared; individual values are not shared.
... Protection	No obvious data sensitivity present.
Definitions	
None.	

KPI	S1. Replication potential [Likert scale]
What is measured	The level of expectation about the replication potential of the solution in other industrial parks.
Unit	Measured on a 5-item Likert Scale
Main data sources	Experts consultation
Monitoring protocol	Before implementation
Level	<input checked="" type="checkbox"/> Park <input type="checkbox"/> Company
Calculation of KPI	
<p>The assessment of the expectation of the replication potential of the solution in other industrial parks is done by asking a set of experts from companies within the park as well as park managers the following question.</p> <p><u>S1. Ex-ante question, to be asked before the implementation of the solution:</u> On a scale from “very high” to “very low or none”:</p> <ol style="list-style-type: none"> 1. Please indicate the extent to which the solution is tailored to the park. 2. Please rate your expectations concerning the replicability of the solution in other parks? 3. Please indicate the replication potential of the core concept. 4. Please indicate the level of adaption required to replicate the core concept to another park. <p>With yes=1 and no=0</p> <ol style="list-style-type: none"> 5. Does the social context influence the replicability of the solution? 6. Does the business model influence the replicability of the solution? 7. Does the technical feasibility influence the replicability of the solution? <p>S1. is answered by different experts from inside the park. Answers have to be collected separately and coded (5 = “very high” to 1 = “Very low or none” and yes=1, no=0). For every set of answers to Q1-4 a single, simple average is calculated using to the procedure described in Section 1.1. These average answers from companies are added up and divided by the total number of companies that provided answers so as to arrive at a single value for REPLICATE_COM_t. Answers from the park management are stored separately as REPLICATE_PARK_t. The binary answers collected in Q5-6 are analysed separately and will be considered in the overall KPI value based on expert judgement.</p> $REPLICATE_COM_t = \frac{\sum_{i=1}^I REPLICATE_COMP_{i,t}}{T_COMP_t}$ <p>with</p> <p>REPLICATE_COMP_{i,t} Likert Scale items (1, ...5) reported by individual company <i>i</i> at time <i>t</i></p> <p>T_COMP_t Total number of stakeholders from within the park that provided answer to S1.</p> <p>REPLICATE_PARK_t Likert Scale items (1, ...5) reported by park manager outside the park</p> <p><i>i</i> Specific company in a park involved in the implementation of the solution</p> <p><i>I</i> Total number of companies in a park involved in the implementation of the solution</p> <p><i>t</i> Point in time data is collected</p>	
<u>Interpretation of KPI</u>	
Very high	The solution is highly replicable from an overall perspective, including social context, affordability/business model and technical feasibility. It is able to adapt to other parks' features and needs without complications.
High	The solution is easily replicable in other parks, from an overall perspective, including social context, affordability/business model and technical feasibility. Minor adjustments may be needed to accomplish the necessity of each park.
Medium	The solution can be replicated in other parks, but mainly in terms of “concept”. Adjustments and modifications are likely needed, as the solution is commonly designed to fit a specific park's constraints in terms of social context, affordability/business model and technical feasibility of a park and is not available in a standard layout directly replicable.

Low	The solution is designed to satisfy specific requirements in terms of social context, affordability/business model and technical feasibility of a park. It is not conceived for replication, even though replication opportunities may arise in specific conditions.
Very low or none	The solution is highly specific and it is designed to satisfy specific requirements in terms of social context, affordability/business model and technical feasibility of a park. It is unlikely that it will be replicated in other parks.
Data ...	
... Recording	Answers are recorded by person responsible for survey/questionnaire
... Storage	Answers are stored by person responsible for survey/questionnaire
... Sharing	Value of REPLICATE_COMP _t and REPLICATE_PARK _t are shared; individual values are not shared.
... Protection	No obvious data sensitivity present.
Definitions	
None	

KPI		S2. Job creation [in %]
What is measured	The ratio between the net number of permanent job places created by the implementation of the solution within the park and its companies and the total number of staff of the park and its companies.	
Unit	%	
Main data sources	HR studies	
Monitoring protocol	Before implementation, every year after implementation	
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company	
Calculation of KPI		
<p>This KPI captures the direct employment effect induced by the implementation of the solution.</p> $JOBS_SOL_t = \frac{\sum_{i=1}^I JOBS_SOL_{i,t}}{T_JOBS_t}$ <p>with</p> <p>JOBS_SOL_{i,t} Number of jobs created by the implementation of the solution in time period <i>t</i></p> <p>T_JOBS_t Total number of jobs in a park in time period <i>t</i></p> <p><i>i</i> Specific company in a park involved in the implementation of the solution</p> <p><i>I</i> Total number of companies in a park involved in the implementation of the solution</p> <p><i>t</i> Point in time when number of jobs is accessed</p>		
Data ...		
... Recording	Answers are recorded by person responsible for survey/questionnaire	
... Storage	Answers are stored by person responsible for survey/questionnaire	
... Sharing	Value of JOBS_SOL _t are shared; individual values are not shared.	
... Protection	No obvious data sensitivity present.	
Definitions		
None		

KPI	S3. Impact on local development [Likert scale]
What is measured	The level of expectation about the impact of the implementation of the solution on local development
Unit	Measured on a 5-item Likert Scale
Main data sources	Experts consultation, municipalities and local authorities consultation
Monitoring protocol	Before implementation and every 3 years after implementation
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company
Calculation of KPI	
<p>The KPI intends to capture an overall impression of the expected impact of the proposed solution on local development and takes into account various potentials effects like additional jobs, additional internal and external services etc. The assessment of the expectation of this impact is done by asking companies within the park as well as stakeholders from outside the park the following questions.</p> <p><u>S3a.: Ex-ante question, to be asked before the implementation of the solution:</u></p> <p>On a scale from “very high” to “very low or none”:</p> <ol style="list-style-type: none"> 1. How do you rate the extent to which the solution involves the local community? 2. How do you rate the solution’s potentials with regard to the exploitation of local products or services? 3. How do you rate the solution’s capability to offer services to non-staff members? 4. How do you rate the involvement of the local municipality? 5. How are your expectations concerning benefits coming from the implementation of the solution? 6. How do you rate the long-term benefits? <p><u>S3b.: Ex-post (yearly) question:</u></p> <p>On a scale form “very high” to “very low or none”:</p> <ol style="list-style-type: none"> 1. How was the extent of the involvement of the local community in the past 12 months? 2. How was the extent of the exploitation of local products or services in the past 12 months? 3. To which extent has the solution offered services to non-staff members in the past 12 months? 4. To which extent has the local municipality been involved in the past 12 months? 5. How do you rate the benefits coming from the implementation of the solution in the past 12 months? 6. How do you rate the long-term benefits? <p>S3a. and S3b. are answered by different individuals inside and outside of the park. Answers have to be collected separately and coded (5 = “very high” to 1 = “Very low or none”). For every set of answers an averaged value is calculated using the procedure described in Section 1.1. These averaged answers from stakeholders inside the park are added up and divided by the total number of stakeholders that provided answers so as to arrive at a single value for $IMPACT_INSIDE_t$. Answers from outside the park are stored separately as $IMPACT_OUTSIDE_t$.</p> $IMPACT_INSIDE_t = \frac{\sum_{i=1}^I IMPACT_INSIDE_{i,t}}{T_INSIDE_t} , IMPACT_OUTSIDE_t = \frac{\sum_{i=1}^I IMPACT_OUTSIDE_{i,t}}{T_OUTSIDE_t}$ <p>with</p> <p>$IMPACT_INSIDE_{i,t}$ Likert Scale items (1, ...5) reported by individual stakeholder i inside the park</p> <p>T_INSIDE_t Total number of stakeholders from within the park that provided answer to S3a. and/or S3b.</p> <p>$IMPACT_OUTSIDE_{i,t}$ Likert Scale items (1, ...5) reported by individual stakeholder i outside the park</p> <p>$T_OUTSIDE_t$ Total number of stakeholders from outside the park that provided answer to S3a. and/or S3b.</p>	

i	Specific stakeholder in- or outside the park
l	Total number of stakeholder in- or outside the park
t	Point in time when survey was done
Interpretation of KPI	
Very positive	The solution has a sensible positive impact on local development. It involves local communities' man work (directly or indirectly) and exploits local products and services. In addition, it offers services that are also available for non-staff members (i.e. mobility, energy services). Local municipalities may be involved and it is expected that it will carry medium/long term benefits.
Positive	The solution has a positive impact on local development. It involves local communities' man work (directly or indirectly) and exploits local products and services. It may offer services that are also available for non-staff members (i.e. mobility, energy services). Local municipalities may be involved and duration of positive effects in time is not foreseeable.
Slightly positive	The solution has a slightly positive impact on local development. Punctual involvement of local man work, or products and services, municipalities is registered or foreseen. Services available for non-staff members may be offered, but positive effects are mainly expected in the short term.
Neutral	The solution has no impact on local development and its effects are confined to the park activities.
Negative	The solution has a negative impact on local development, for example in terms of mobility, local job opportunities, and services to the local community.
Data ...	
... Recording	Answers are recorded by person responsible for survey/questionnaire
... Storage	Answers are stored by person responsible for survey/questionnaire
... Sharing	Value of $IMPACT_INSIDE_t$ and $IMPACT_OUTSIDE_t$ are shared; individual values are not shared.
... Protection	No obvious data sensitivity present.
Definitions	
None	

KPI	S4. Impact on human health and safety [Likert scale]
What is measured	The level of human health and safety impacts associated with the implementation of the solution
Unit	Measured on a 5-item Likert scale
Main data sources	Health and Safety experts consultation
Monitoring protocol	Before implementation and every year after implementation
Level	<input checked="" type="checkbox"/> Park <input type="checkbox"/> Company
Calculation of KPI	
<p>The assessment of the potential effects on human health and safety is done by asking a set of experts on these issues the following questions.</p> <p>S4a.: Ex-ante question, to be asked before the implementation of the solution:</p> <p>On a scale from “5=very positive” to “1=very negative”:</p> <ol style="list-style-type: none"> 1. <i>What are your expectations concerning impacts on human health and safety related to the solution?</i> 2. <i>To which extent does the solution mitigate any pre-existing risk?</i> <p>On a scale from 1=“nobody”, to 5=“everybody in the company/park”</p> <ol style="list-style-type: none"> 3. <i>How many people would be affected?</i> <p>S4b.: Ex-post (yearly) question:</p> <p>On a scale from “5=very positive” to “1=very negative”:</p> <ol style="list-style-type: none"> 1. <i>How do you rate the impact on human H&S directly due to the solution?</i> 2. <i>To which extent has the solution mitigated any pre-existing risk?</i> <p>On a scale from 1=“nobody”, to 5=“everybody in the company/park”</p> <ol style="list-style-type: none"> 3. <i>How many people were affected?</i> <p>S4a. and S4b. are answered by different experts inside and outside of the park. For every set of answers an averaged value is calculated using the procedure described in Section 1.1. Answers from experts are added up and divided by the total number of experts that provided answers so as to arrive at a single value for HEALTH_PARK_t.</p> $HEALTH_PARK_t = \frac{\sum_{i=1}^I HEALTH_EXPERT_{i,t}}{T_EXPERT_t}$ <p>with</p> <p>HEALTH_EXPERT_{i,t} Likert Scale items (1, ...5) reported by individual expert <i>i</i> at time <i>t</i></p> <p>T_EXPERT_t Total number of experts that provided answer to S4a. and/or S4b.</p> <p><i>i</i> Specific expert interviewed</p> <p><i>I</i> Total number of experts interviewed</p> <p><i>t</i> Point in time when survey was done</p>	
Interpretation of KPI	
Very positive	Potential risks for health and safety caused by the solution are negligible and risks related to baseline status of the park are significantly mitigated in terms of consequences and people affected thanks to the implementation of the solution.
Positive	Potential risks for health and safety caused by the solution are negligible, and there is an overall beneficial effect on the baseline health and safety status of the park.
Slightly positive	Potential risks for health and safety caused by the solution are negligible and there are overall slight beneficial effects on the baseline health and safety status of the park.
Neutral	Potential risks for health and safety caused by the solution are negligible.
Negative	There are risks associated to the implementation of the solution, in terms of severity of consequences or number of people affected.
Data ...	
... Recording	Answers are recorded by person responsible for survey/questionnaire
... Storage	Answers are stored by person responsible for survey/questionnaire

... Sharing	Value of HEALTH_EXPERT _t are shared; individual values are not shared.
... Protection	Data sensitivity needs to be assessed on a case by case basis; special care needs to be taken concerning employees in the park in order not to violate their privacy.
Definitions	
None	

KPI	S5. Benefits for sustainable mobility [Likert scale]
What is measured	The level of expectation concerning the beneficial effects of the solution on sustainable mobility.
Unit	Measured on a 5-item Likert scale, binary
Main data sources	Experts consultation, municipalities and local authorities consultation
Monitoring protocol	Before implementation and every 3 years after implementation
Level	<input checked="" type="checkbox"/> Park <input type="checkbox"/> Company
Calculation of KPI	
<p>The assessment of the expectation of the beneficial effects of the solution on sustainable mobility is done by asking a wider audience inside as well as outside of the park the following questions.</p> <p><u>S5a: Ex-ante question, to be asked before the implementation of the solution:</u></p> <p>On a scale from “5=very positive” to “1=very negatively”:</p> <ol style="list-style-type: none"> To which extent does the solution increase the number of people using shared mobility or green mobility? To which extent is the accessibility to the park improved by the solution? <p>On a scale from 1=“very negatively” to 5=“very positively”</p> <ol style="list-style-type: none"> How does the solution affect the time spent in transportation to/from the workplace? How is transportation cost affected by the solution? <p>On a scale from 1= “no one” to 5= “a significant number of staff members and non-staff members”</p> <ol style="list-style-type: none"> To whom will the benefits be available to? <p><u>S5b: Ex-post (yearly) question:</u></p> <p>On a scale from “5=very positive” to “1=very negatively”:</p> <ol style="list-style-type: none"> Has the solution increased the number of people using shared mobility or green mobility? Has the accessibility to the park been improved by the solution? <p>On a scale from 5=“very positively” to 1=“very negatively”</p> <ol style="list-style-type: none"> How has the solution affected the time spent in transportation to/from the workplace? How has transportation cost been affected by the solution? <p>On a scale from 5 = “a significant number of staff members and non-staff members” to 1 = “no one”</p> <ol style="list-style-type: none"> To whom were the benefits available to? <p>S5a. and S5b. are answered by different individuals inside and outside of the park. Answers have to be collected separately and coded (5 = “very high” to 1 = “Very low or none”). For every set of answers a single average value is calculated using the procedure described in Section 1.1. Answers from stakeholders inside the park are added up and divided by the total number of stakeholders that provided answers so as to arrive at a single value for SUSMOBIL_INSIDE_t. Answers from outside the park are stored separately as SUSMOBIL_OUTSIDE_t.</p> $SUSMOBIL_INSIDE_t = \frac{\sum_{i=1}^I SUSMOBIL_INSIDE_{it}}{T_INSIDE_t}, SUSMOBIL_OUTSIDE_t = \frac{\sum_{i=1}^I SUSMOBIL_OUTSIDE_{it}}{T_OUTSIDE_t}$ <p>with</p> <p>SUSMOBIL_INSIDE_{i,t} Likert Scale items (1, ...5) reported by individual stakeholder <i>i</i> inside the park</p> <p>T_INSIDE_t Total number of stakeholders from within the park that provided answer to S5a. and/or S5b.</p> <p>SUSMOBIL_OUTSIDE_{i,t} Likert Scale items (1, ...5) reported by individual stakeholder <i>i</i> outside the park</p> <p>T_OUTSIDE_t Total number of stakeholders from outside the park that provided answer to S5a. and/or S5b.</p> <p><i>i</i> Specific stakeholder in a park involved in the implementation of the solution</p> <p><i>I</i> Total number of stakeholders in a park involved in the implementation of the solution</p> <p><i>t</i> Point in time when survey was done</p>	

Interpretation of KPI	
Very high	The solution produces visible benefits for a sustainable mobility, both for the park staff members and non-members. A high percentage of the park staff is positively affected by the solution. Moreover, at least two of the following facts are registered/foreseen in the daily mobility: increase in the number of people using shared mobility or “green” vehicles; decrease of time spent in transportations to/from the work place; decrease of transportation costs; improved accessibility to the park facilities.
High	The solution produces visible benefits for a sustainable mobility, especially for park staff members. A high percentage of the staff is positively affected by the solution. Moreover, at least one of the following facts is registered/foreseen in the daily mobility: increase in the number of people using shared mobility or “green” vehicles; decrease of time spent in transportations to/from the work place; decrease of transportation costs; improved accessibility to the park facilities.
Medium	The solution produces benefits for a sustainable mobility, mainly for staff members and only rarely for local population. A limited percentage of the park staff benefits from the solution in its daily mobility, but only occasionally positive effects affect a high percentage of staff members.
Low	The solution produces limited benefits for a sustainable mobility of staff members. Only a very limited percentage of staff members benefits from the solution and most of it only occasionally.
Very low or none	The solution does not produce benefits for a sustainable mobility, for neither staff members or local population.
Data ...	
... Recording	Answers are recorded by person responsible for survey/questionnaire
... Storage	Answers are stored by person responsible for survey/questionnaire
... Sharing	Value of SUSMOBIL_INSIDEt and SUSMOBIL_OUTSIDEt are shared; individual values are not shared.
... Protection	No obvious data sensitivity present.
Definitions	
Sustainable mobility/Transport	A sustainable mobility/transport system is one that i) allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations; ii) is affordable, operates fairly and efficiently, offers a choice of transport mode and supports a competitive economy, as well as balanced regional development; iii) Limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and uses non-renewable resources at or below the rates of development of renewable substitutes, while minimizing the impact on the use of land and the generation of noise. [European Union Council of Ministers of Transport (2004)]

KPI		E1. Total annual water consumption [l/year], [m ³ /year]
What is measured	The total amount of water consumed at park level.	
Unit	litres/year or m ³ /year	
Main data sources	Water bills and resource efficiency audits (company or park level), monitoring systems, specific studies	
Monitoring protocol	Before implementation and every year after implementation	
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company	
Calculation of KPI		
<p>Water consumption will significantly differ between companies in parks, as well as between parks. Average values will therefore be of low significance, but changes within companies and parks may serve as an interesting KPI and allow a more thorough assessment of the effects of the implementation of the solution on overall resource efficiency.</p> $WATER_CON_COM_t = \sum_{i=1}^I WATER_CON_COM_{i,t}$ <p>and $\Delta WATER_CON_PARK = \frac{\sum_{i=1}^I WATER_CON_t}{\sum_{i=1}^I WATER_CON_{t-1}}$</p> <p>and $\Delta WATER_CON_COM_t = \frac{WATER_CON_COM_t}{WATER_CON_COM_{t-1}}$</p> <p><i>if <1 there was a reduction from year t-1 to year t, if >1 water consumption increased.</i></p> <p>with</p> <p>WATER_CON_COM_{i,t} Volume of annual water consumption of company <i>i</i> involved in the implementation of the solution in a park at point in time <i>t</i></p> <p>WATER_CON_COM_{i,t-1} Volume of annual water consumption of company <i>i</i> involved in the implementation of the solution in a park one year before point in time <i>t</i></p> <p><i>i</i> Specific company in a park involved in the implementation of the solution</p> <p><i>I</i> Total number of companies in a park involved in the implementation of the solution</p> <p><i>t</i> Time period for which water consumption is assessed</p>		
Data ...		
... Recording	Companies report their annual water consumption according to water bills and/or own measurements (e.g. when own water sources are utilized); Park records water consumption for facilities in the park's responsibility.	
... Storage	Data are stored by responsible person at the companies, KPI at park level	
... Sharing	Individual data and KPI is only shared with individual company, sum of consumption and general KPI is shared with all stakeholders	
... Protection	Data sensitivity needs to be assessed on a case by case basis	
Definitions		
Total annual water consumption	The sum of the fresh water utilized by all stakeholders within one year, either in [litres/year] or [m ³ /year].	

KPI		E2. Total annual waste generation [in kg/year]	
What is measured	The total mass of solid waste annually generated at park level. <i>If data availability allows, this KPI can also be used to differentiate between types of wastes.</i>		
Unit	kg/year		
Main data sources	Waste registers, waste traceability systems, resource efficiency audits, specific studies (company or park level)		
Monitoring protocol	Before implementation and every year after implementation		
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company		
Calculation of KPI			
<p>Waste generation will significantly differ between companies in parks, as well as between parks. Average values will therefore be of low significance, but changes within companies and parks may serve as an interesting KPI and allow a more thorough assessment of the effects of the implementation of the solution on overall resource efficiency.</p> $WASTE_COM_t = \sum_{i=1}^l WASTE_COM_{i,t}$ <p>and $\Delta WASTE_PARK_t = \frac{\sum_{i=1}^l WASTE_COM_{i,t}}{\sum_{i=1}^l WASTE_COM_{i,t-1}}$</p> <p>and $\Delta WASTE_COMP_t = \frac{WASTE_COM_t}{WASTE_COM_{t-1}}$</p> <p><i>if $\Delta < 1$ there was a reduction from year t-1 to year t, if $\Delta > 1$ waste generation increased.</i></p> <p>with</p> <p>$WASTE_COM_{i,t}$ Mass of annual waste generation of company <i>i</i> involved in the implementation of the solution in a park at point in time <i>t</i>.</p> <p>$WASTE_COM_{i,t-1}$ Mass of annual waste generation of company <i>i</i> involved in the implementation of the solution in a park one year before point in time <i>t</i></p> <p><i>i</i> Specific company in a park involved in the implementation of the solution</p> <p><i>l</i> Total number of companies in a park involved in the implementation of the solution</p> <p><i>t</i> Time period for which waste generation is assessed</p>			
Data ...			
... Recording	Companies report their annual waste generation according to disposal bills and/or own measurements/calculations; Park records waste generation of facilities in the park's responsibility.		
... Storage	Data are stored by responsible person at the companies, KPI at park level		
... Sharing	Individual data and KPI is only shared with individual company, sum of consumption and general KPI is shared with all stakeholders		
... Protection	Data sensitivity needs to be assessed on a case by case basis.		
Definitions			
Total annual waste generation	The total mass of solid waste annually generated at park and company level, eventually distinguished by kind of waste.		

KPI		E3. Annual by-products internal use [in kg/year]
What is measured	The mass of by-products both produced and exploited within the park's activities over the total mass of by-products generated within the park.	
Unit	kg/year	
Main data sources	Resource efficiency audits, specific studies (company level)	
Monitoring protocol	Before implementation and every year after implementation	
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company	
Calculation of KPI		
<p>The use of by-products as oppose to waste recycling and reuse as discussed above, may significantly increase overall resource efficiency in the park as well as for individual companies. This KPI measures the extent to which the implementation of the solution impacts the internal use of by-products.</p> $BYPRO_PARK_t = \frac{\sum_{i=1}^I BYPRO_USE_COM_{i,t}}{\sum_{i=1}^I BYPRO_T_COM_{i,t-1}}$ <p>and $BYPRO_COM_t = \frac{BYPRO_USE_COM_{i,t}}{BYPRO_T_COM_{i,t-1}}$</p> <p>with</p> <p>BYPRO_USE_COM_{i,t} Mass of annual by-products exploited by company <i>i</i> involved in the implementation of the solution in a park at point in time <i>t</i></p> <p>BYPRO_T_COM_{i,t} Mass of annual by-products of company <i>i</i> involved in the implementation of the solution in a park at point in time <i>t</i></p> <p><i>i</i> Specific company in a park involved in the implementation of the solution</p> <p><i>I</i> Total number of companies in a park involved in the implementation of the solution</p> <p><i>t</i> Time period for which by-product use is assessed</p>		
Data ...		
... Recording	Companies report their annual by-product generation according to production key figures and/or disposal bills and/or by-product sales; Park records by-product generation of facilities in the park's responsibility.	
... Storage	Data are stored by responsible person at the companies, KPI at park level	
... Sharing	Individual data and KPI is only shared with individual company, sum of consumption and general KPI is shared with all stakeholders	
... Protection	Data sensitivity needs to be assessed on a case by case basis.	
Definitions		
by-products	<p>Article 5 of the Waste Framework Directive 2008/98/EC describes by-products as a substance or object, resulting from a production process, the primary aim of which is not the production of that item, may be regarded as not being waste [...] but as being a by-product only if the following conditions are met: (a) further use of the substance or object is certain; (b) the substance or object can be used directly without any further processing other than normal industrial practice; (c) the substance or object is produced as an integral part of a production process; and (d) further use is lawful, i.e. the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.</p>	

KPI		E4. Total annual primary energy consumption [in MWh/year]
What is measured	The total annual energy consumption, including both purchased and self-produced energy.	
Unit	MWh/year	
Main data sources	Energy bills, monitoring systems, energy audits, specific studies (company and park level)	
Monitoring protocol	Before implementation and every year after implementation	
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company	
Calculation of KPI		
<p>This KPI captures the total annual primary energy consumption in a park or on company level. Primary energy consumption is assessed for 1) Electricity, 2) Gas and 3) Fuels used within a 1-year period and is gathered from energy bills, monitoring systems, etc. The calculation of this KPI will significantly vary between companies and parks, and will heavily depend on data availability and the monitoring system(s) in place. Therefore, the following formulas only give an indicative assessment of the individual factors that shall be considered when calculating the overall primary energy consumption.</p> $ENERGY_CONS_TOTAL_t = \sum_{i=1}^I REC_{i,t} + \sum_{i=1}^I NEC_{i,t} = \sum_{i=1}^I ECself_{i,t} + \sum_{i=1}^I ECpur_{i,t}$ $ENERGY_CONS_T_SELF_t = \sum_{i=1}^I RECself_{i,t} + \sum_{i=1}^I NECself_{i,t} = \sum_{i=1}^I ECself_{i,t}$ $ENERGY_CONS_T_PUR = \sum_{i=1}^I RECpur_{i,t} + \sum_{i=1}^I NECpur_{i,t} = \sum_{i=1}^I ECpur_{i,t}$ <p>with</p> <p>REC_{i,t} Annual renewable primary energy consumption in MWh of company <i>i</i> involved in the implementation of the solution in a park at point in time <i>t</i>.</p> <p>NEC_{i,t} Annual non-renewable primary energy consumption in MWh of company <i>i</i> involved in the implementation of the solution in a park at point in time <i>t</i>.</p> <p>EC_{i,t-1} Annual primary energy consumption in MWh of company <i>i</i> involved in the implementation of the solution in a park one year before point in time <i>t</i></p> <p>self Indicator for self-produced primary energy by a company</p> <p>pur Indicator for purchased primary energy by a company</p> <p><i>i</i> Specific company in a park involved in the implementation of the solution</p> <p><i>I</i> Total number of companies in a park involved in the implementation of the solution</p> <p><i>t</i> Time period for which energy consumption is calculated</p> <p>When calculating primary electricity consumption, primary energy factors (PEF) need to be taken into account. Currently, no official list of national PEF are available; on the EU level, a default conversion factor of 2.0 can be used e.g. in the framework of the Energy Efficiency Directive, but other justifiable values can be used as well. For the sake of the calculation of this KPI, we suggest to use either this default value or any other available, national factor for purchased electricity and use a factor of 1.0 for any self-produced electricity by renewable energy sources. For gas and fuels consumptions, conversion is not necessary.</p>		
Data ...		
... Recording	<p>Companies report their total annual primary (non-)renewable energy consumption, total (non-)renewable energy generation (thermal and electrical) within their companies according to electricity/gas/fuel/heat/cold etc. bills and/or own measurements and/or measurements by their grid operator/energy supplier (for (non-)renewable energy fed into a grid, sold to others and used by themselves). The park operator records the same for facilities in the park's responsibility.</p>	

... Storage	Data are stored by the responsible person at the companies, KPI at park level
... Sharing	Individual data and KPI is only shared with individual company, sum of consumption and general KPI is shared with all stakeholders
... Protection	Energy consumption data are sensitive data. Data protection will have to be assessed on a case by case discussion.
Definitions	
energy from renewable sources	Directive 2009/28/EC (Article 2a): 'energy from renewable sources' means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases
Conversion factor	An primary energy factor of 2.0 is proposed in the proposal for a directive of the European Parliament and of the Council amending Directive 2012/27/EU on energy efficiency in Annex IV and V (https://bit.ly/2yKgep9)

KPI	E5. Total annual emission of greenhouse gases [in kgCO ₂ e/year]
What is measured	The total mass of greenhouse gases emitted at park level in a year
Unit	kgCO ₂ e/year
Main data sources	Resource efficiency audits and energy audits, bills, fuel cards, specific studies, literature analysis, commercial software
Monitoring protocol	Before implementation and every year after implementation
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company
Calculation of KPI	
<p>The assessment of GHG emissions on company and park level will significantly differ between types of parks, most notably between companies involved in the European Emission Trading Scheme (ETS) and other, smaller companies that have not had a legal obligation to monitor their emissions.</p> $GHG_PARK_t = \sum_{i=1}^I GHG_COM_{i,t}$ <p>and $\Delta GHG_PARK_t = \frac{\sum_{i=1}^I GHG_COM_{i,t}}{\sum_{i=1}^I GHG_COM_{i,t-1}}$</p> <p>and $\Delta GHG_COM_t = \frac{GHG_COM_{i,t}}{GHG_COM_{i,t-1}}$</p> <p>if $\Delta < 1$ there was a reduction from year t-1 to year t, if $\Delta > 1$ GHG emission increased.</p> <p>with</p> <p>GHG_COM_{i,t} Mass of annual generation of CO₂e equivalent of company <i>i</i> involved in the implementation of the solution in a park at point in time <i>t</i>.</p> <p>GHG_{i,t-1} Mass of annual generation of CO₂e equivalent emissions of company <i>i</i> involved in the implementation of the solution in a park one year before point in time <i>t</i></p> <p><i>i</i> Specific company in a park involved in the implementation of the solution</p> <p><i>I</i> Total number of companies in a park involved in the implementation of the solution</p> <p><i>t</i> Time period for which GHG emissions are calculated</p>	
Data ...	
... Recording	Companies report their total annual air emissions concerning GHG according to measurements, energy audits, bills, fuel cards, specific studies and/or calculations. The park operator records the same for facilities in the park's responsibility. The emissions are converted to CO ₂ equivalents (CO ₂ e), followed by the calculation of the KPIs.
... Storage	Data are stored by responsible person at the companies, KPI at park level
... Sharing	Individual data and KPI is only shared with individual company, sum of consumption and general KPI is shared with all stakeholders
... Protection	Emission data are sensitive data. Data protection will have to be assessed on a case by case discussion.
Definitions	
GHG	Greenhouse gases refer to carbon dioxide, nitrous oxide, methane, ozone and chloro—fluorocarbons occurring naturally and resulting from human (production and consumption) activities, and contributing to the greenhouse effect (global warming).

KPI		E6. Renewable energy source share [in %]
What is measured	Renewable energy produced within the park and total energy consumption	
Unit	in %	
Main data sources	Specifications of renewable energy production systems, monitoring systems, specific studies (park level)	
Monitoring protocol	Before implementation and every year after implementation	
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company	
Calculation of KPI		
<p>This KPI aims at calculating the ratio between the consumption of energy (electricity and heat) produced from renewable energy sources onsite and total energy consumption (electricity and heat) calculated within one year. Consumptions can refer to the entire park or to companies. All renewable energy forms shall be included: wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases. As with other energy consumption related indicators, the calculation of this KPI will significantly differ between companies and parks. Therefore, the following formulas only intent to give an overall assessment of the calculation:</p> $RES_ENERGY_CONS_PARK_t = \sum_{i=1}^I REG_{i,t}$ $ENERGY_CONS_T_PARK_t = \sum_{i=1}^I EC_{i,t}$ <p>and $SHARE_RES_ENERGY_PARK_t = \frac{RES_ENERGY_CONS_PARK_t}{ENERGY_CONS_T_PARK_t}$</p> <p>with</p> <p>REG_{i,t} Annual renewable primary energy generation in kWh of company <i>i</i> involved in the implementation of the solution in a park at point in time <i>t</i>.</p> <p>EC_{i,t-1} Annual primary energy consumption in kWh of company <i>i</i> involved in the implementation of the solution in a park one year before point in time <i>t</i></p> <p><i>t</i> Time period for which consumption and production are calculated</p>		
Data ...		
... Recording	Companies report their total annual primary energy consumption and total renewable energy generation (thermal and electrical) within their companies according to electricity/gas/fuel/heat/cold etc. bills and/or own measurements and/or measurements by their grid operator/energy supplier (for renewable energy fed into a grid, sold to others and used by themselves). The park operator records the same for facilities in the park's responsibility.	
... Storage	Data are stored by responsible person at the companies, KPI at park level	
... Sharing	Individual data and KPI is only shared with individual company, sum of consumption and general KPI is shared with all stakeholders	
... Protection	Energy consumption data are sensitive data. Data protection will have to be assessed on a case by case discussion.	
Definitions		
energy from renewable sources	Directive 2009/28/EC (Article 2a): 'energy from renewable sources' means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases;	

KPI		E7. Total Annual Air Emissions [in kg/year]	
What is measured	The total mass of air pollutants emitted at park level in a year		
Unit	kg/year		
Main data sources	Metering systems, specific studies, fuel cards (company or park level)		
Monitoring protocol	Before implementation and every year after implementation		
Level	<input checked="" type="checkbox"/> Park	<input checked="" type="checkbox"/> Company	
Calculation of KPI			
<p>The assessment of air emissions on company and park level will significantly differ between types of parks and companies' activities within parks. Also, the type of air emissions that have to be considered will differ significantly. The following formula therefore assumes ex-ante knowledge about the actual air emissions.</p> $AIREM_T_PARK = \sum_{i=1}^I AIREM_COM_{i,t}$ <p>and $\Delta AIREM_T_Park = \frac{\sum_{i=1}^I AIREM_COM_{i,t}}{\sum_{i=1}^I AIREM_COM_{i,t-1}}$</p> <p>and $\Delta AIREM_COM_t = \frac{AIREM_COM_t}{AIREM_COM_{t-1}}$</p> <p>if $\Delta < 1$ there was a reduction from year t-1 to year t, if $\Delta > 1$ air emissions increased.</p> <p>with</p> <p>$AIREM_COM_{i,t}$ Mass of annual air emissions of company i involved in the implementation of the solution in a park at point in time t.</p> <p>$AIREM_COM_{i,t-1}$ Mass of annual air emissions generation of company i involved in the implementation of the solution in a park one year before point in time t</p> <p>i Specific company in a park involved in the implementation of the solution</p> <p>I Total number of companies in a park involved in the implementation of the solution</p> <p>t Point in time when emissions are assessed</p>			
Data ...			
... Recording	Companies report their total annual air emissions according to measurements and/or calculations. The park operator records the same for facilities in the park's responsibility.		
... Storage	Data are stored by responsible person at the companies, KPI at park level		
... Sharing	Individual data and KPI is only shared with individual company, sum of consumption and general KPI is shared with all stakeholders		
... Protection	Emission data are sensitive data. Data protection will have to be assessed on a case by case discussion.		
Definitions			
Air pollutant	The main pollutants are: Particulate Matter, nitrogen oxides, ozone, hydrocarbons and volatile organic compounds, sulphur dioxide, carbon monoxide. See https://www.airqualitynow.eu/pollution_home.php for further definition.		

KPI	E8. Reduction of indirect (Scope 3) greenhouse gases [Likert scale]
What is measured	Reduction of indirect (Scope 3) GHG emissions caused by the implementation and functioning of the solution.
Unit	Measured on a 5-item Likert scale
Main data sources	Experts consultation, audit, consultation with staff members (managers and employees)
Monitoring protocol	Before implementation and every three after implementation
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company
Calculation of KPI	
<p>The KPI intends to capture the emissions resulting from value chain activities, excluding those related to the generation of purchased energy consumed. The evaluation of this type of emissions helps the parks and companies to understand their full value chain emissions impact in order to focus efforts on the greatest GHG reduction opportunities. The calculation of this KPI is done by asking relevant staff members and managers, eventually supported by experts the following three questions:</p> <p><i>E8. Ex-ante question, to be asked before the implementation:</i></p> <p>On a scale from 1="not at all" to 5="very positively"</p> <p>1. <i>To which extent does the solution affect any type of Scope 3 GHG?</i></p> <p>On a scale from 1="a very low number or none" to 5="Two or more types are affected"</p> <p>2. <i>How many different types are affected?</i></p> <p>On a scale from 1="very low reduction" to 5="very significant reduction"</p> <p>3. <i>Do you expect this reduction to be significant?</i></p> <p>E8 can be answered by individual companies, by park managers as well as by external experts. Answers are collected and coded (5 = "very high" to 1 = "Very low or none"). For every set of answers a single, simple average is calculated using to the procedure described in Section 1.1. Answers are added up and divided by the total number of stakeholders that provided answers so as to arrive at a single value for SCOPE3_PARK_t.</p> $SCOPE3_PARK_t = \frac{\sum_{i=1}^I SCOPE3_STAKE_{i,t}}{T_STAKE_t}$ <p>with</p> <p>SCOPE3_STAKE_{i,t} Likert Scale items (1, ...5) reported by individual stakeholder</p> <p>T_STAKE_t Number of stakeholders that provided answer to T4a. and/or T4b.</p> <p>i Specific company in a park involved in the implementation of the solution</p> <p>I Total number of companies in a park involved in the implementation of the solution</p> <p>t Point in time when data is collected</p> <p><u>Interpretation of KPI</u></p> <p>Very high Two or more types of Scope 3 GHG emissions are reduced by the implementation and functioning of the solution. Reductions are expected to be significant as, for example, emissions due to activities of high percentages of staff/assets are reduced or emissions related to notably highly GHG-emitting activities are reduced.</p> <p>High Two or more types of Scope 3 GHG emissions are reduced by the implementation and functioning of the solution.</p> <p>Medium One type of Scope 3 GHG emission is reduced by the implementation and functioning of the solution. Reduction is expected to be significant as, for example, emissions due to activities of high percentages of staff/assets are reduced or emissions related to notably highly GHG-emitting activities are reduced.</p> <p>Low One type of Scope 3 GHG emission is reduced by the implementation and functioning of the solution.</p> <p>Very low or none Scope 3 GHG emissions are not reduced by the implementation and functioning of the solution.</p>	
Data ...	

... Recording	Companies report their total indirect GHGs. The park operator records the same for facilities in the park's responsibility.
... Storage	Data are stored by responsible person at the companies, KPI at park level
... Sharing	Individual data and KPI is only shared with individual company, sum of consumption and general KPI is shared with all stakeholders
... Protection	Emission data are sensitive data
Definitions	
Scope 3 indirect GHG emissions	Emissions resulting from value chain activities, excluding those related to the generation of purchased energy consumed, according to GHG Protocol

KPI		T1. Thermal Energy Recovery [in %/year]
What is measured	The percentage of thermal energy annually recovered divided by the total amount of thermal energy annually consumed at park level.	
Unit	% / year	
Main data sources	Energy bills, monitoring systems, energy audits, specific studies (company and park level)	
Monitoring protocol	Before implementation in order to establish a baseline value and every year after implementation	
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company	
Calculation of KPI		
<p>This KPI measures the results of energy efficiency strategies implemented to increase thermal energy recovery within a process/plant/park. All types of thermal energy recovery processes are accounted for in this KPI, independent of qualitative aspects (like temperatures), technical aspects (heat pumps, heat exchanger) or internal or external use of the recovered energy. Data for estimation of thermal energy annually recovered shall be retrieved from audits, measures, design assumptions or calculations. Projections for scenarios different from the baseline/current status can be obtained by technical studies, own estimation, based on expert judgement and opinion. As with other energy consumption related KPIs discussed above, no standard calculation process can be used in the assessment of this KPI, as companies and parks, as well as the data available to them will significantly differ. The following formula therefore only gives an indication of the aim of this KPI.</p> $\Delta REC_THERM_EN_PARK_{t,t-1} = \frac{\sum_{i=1}^I RTE_{i,t}}{\sum_{i=1}^I TEC_{i,t-1}}$ <p>with</p> <p>RTE_{i,t} Annual thermal energy recovered by company <i>i</i> involved in the implementation of the solution in a park at point in time <i>t</i></p> <p>TEC_{i,t} Annual thermal energy consumption by company <i>i</i> involved in the implementation of the solution in a park at point in time <i>t</i></p> <p><i>t</i> Point in time calculation is done</p>		
Data ...		
... Recording	Companies report their total annual primary (non-)renewable thermal energy consumption and total thermal energy recovery within their companies according to electricity/gas/fuel/heat/cold etc. bills and/or own measurements and/or measurements by their grid operator/energy supplier. The park operator records the same for facilities in the park's responsibility.	
... Storage	Data are stored by responsible person at the companies, KPI at park level	
... Sharing	Individual data and KPI is only shared with individual company, sum of thermal energy consumption, sum of recovered thermal energy and general KPI is shared with all stakeholders	
... Protection	Data may be sensitive in cases in which it allows estimation of overall energy use and / or production levels.	
Definitions		
Thermal Energy	Energy based on the consumption and/or conversion of electricity, gas, fuel, district heat/cold, waste heat/cold, solar thermal, geothermal, aerothermal, hydrothermal etc. energy sources.	

KPI	T2. Technical Feasibility [Likert scale]										
What is measured	The level of expectation about the feasibility of the implementation of the solution from a technical and technological perspective										
Unit	Measured on a 5-item Likert scale										
Main data sources	Indications from suppliers and installers, companies and parks										
Monitoring protocol	Before implementation										
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company										
Calculation of KPI											
<p>The assessment of the expectation of the technical feasibility of the performance of a solution is done ex-ante by asking appointed people on the company level and on the park level the following question.</p> <p><i>T2.: Ex-ante question to be asked before implementation:</i></p> <p>With 1=yes and 0=no:</p> <ol style="list-style-type: none"> Do you foresee major modification to the current network of infrastructures and lines to deploy the solution? <ol style="list-style-type: none"> if yes: Are the identified modifications a natural consequence of the solution or they are needed just to deploy it? During the deployment time, do you expect the functionality of some area of the park to be compromised? <ol style="list-style-type: none"> if yes: please answer on a scale from 5="small interferences" to 1="significant interferences": How do you rate these interferences? Do you expect the solution to be flexible to possible future changes in the park? <p>T2 can be answered by individual companies as well as by park managers. Answers have to be collected separately and coded. As this KPI captures binary answers and Likert scale answers simultaneously, it needs to be qualitatively assessed and interpreted. The calculation of averaged values (as done in other qualitative KPIs) is not a valid approach here. Having collected the answers to the set of questions presented above, the binary results and the Likert scale results will be presented separately and the overall KPI value will be assessed by expert judgement.</p> <p><u>Interpretation of KPI</u></p> <table border="0"> <tr> <td>Very high</td> <td>The present network of infrastructures and lines is compatible with the solution or requires only minor and quick adjustments, without any reduction of the park functionality. In addition, no major obstacles are foreseen in case of future changes in the layout of the solution.</td> </tr> <tr> <td>High</td> <td>The present network of infrastructures and lines is generally compatible, but it requires only minor and quick adjustments that can reduce the functionality of a limited area of the park for a short period. In addition, no major obstacles are foreseen in case of future changes in the layout of the solution.</td> </tr> <tr> <td>Medium</td> <td>The present network of infrastructures and lines requires some modifications and minor additional components for the implementation and functioning of the solution. The functionality of some areas of the park is reduced or compromised during the deployment time.</td> </tr> <tr> <td>Low</td> <td>The present network of infrastructures and lines requires considerable modifications or additional components for the implementation and functioning of the solution. The functionality of some areas of the park is reduced or compromised during the deployment time.</td> </tr> <tr> <td>Very low or none</td> <td>The present network of infrastructures and lines is not adequate to integrate the solution. Heavy modifications must be carried out or several additional components must be installed. The functionality of considerable areas of the park is reduced or compromised during the deployment time.</td> </tr> </table>		Very high	The present network of infrastructures and lines is compatible with the solution or requires only minor and quick adjustments, without any reduction of the park functionality. In addition, no major obstacles are foreseen in case of future changes in the layout of the solution.	High	The present network of infrastructures and lines is generally compatible, but it requires only minor and quick adjustments that can reduce the functionality of a limited area of the park for a short period. In addition, no major obstacles are foreseen in case of future changes in the layout of the solution.	Medium	The present network of infrastructures and lines requires some modifications and minor additional components for the implementation and functioning of the solution. The functionality of some areas of the park is reduced or compromised during the deployment time.	Low	The present network of infrastructures and lines requires considerable modifications or additional components for the implementation and functioning of the solution. The functionality of some areas of the park is reduced or compromised during the deployment time.	Very low or none	The present network of infrastructures and lines is not adequate to integrate the solution. Heavy modifications must be carried out or several additional components must be installed. The functionality of considerable areas of the park is reduced or compromised during the deployment time.
Very high	The present network of infrastructures and lines is compatible with the solution or requires only minor and quick adjustments, without any reduction of the park functionality. In addition, no major obstacles are foreseen in case of future changes in the layout of the solution.										
High	The present network of infrastructures and lines is generally compatible, but it requires only minor and quick adjustments that can reduce the functionality of a limited area of the park for a short period. In addition, no major obstacles are foreseen in case of future changes in the layout of the solution.										
Medium	The present network of infrastructures and lines requires some modifications and minor additional components for the implementation and functioning of the solution. The functionality of some areas of the park is reduced or compromised during the deployment time.										
Low	The present network of infrastructures and lines requires considerable modifications or additional components for the implementation and functioning of the solution. The functionality of some areas of the park is reduced or compromised during the deployment time.										
Very low or none	The present network of infrastructures and lines is not adequate to integrate the solution. Heavy modifications must be carried out or several additional components must be installed. The functionality of considerable areas of the park is reduced or compromised during the deployment time.										
Data ...											
... Recording	Answers are recorded by person responsible for survey/questionnaire										
... Storage	Answers are stored by person responsible for survey/questionnaire										
... Sharing	Value of FEASIBILITY_COMP _t and FEASIBILITY_PARK _t are shared; individual										

	values are not shared.
... Protection	No obvious data sensitivity present.
Definitions	
None	

KPI	T3. Annual Uniformity [Likert scale]
What is measured	The level of expectation about the performance of the solution in time and its seasonality.
Unit	Measured on a 5-item Likert scale
Main data sources	Assessment from appointed people within the park and companies, based on expert judgement
Monitoring protocol	Before implementation and every year after implementation
Level	<input checked="" type="checkbox"/> Park <input checked="" type="checkbox"/> Company
Calculation of KPI	
<p>The assessment of the expectation of the uniformity of the performance of a solution within a 12 month (yearly) cycle is done by asking appointed people on the company level and on the park level the following two questions.</p> <p><i>T3a. Ex-ante question, to be asked before the implementation of the solution:</i> On a scale from “very high” to “very low or none”: 5. Please indicate your expectation of the uniformity of effects of the solution over a yearly cycle.</p> <p><i>T3b. Ex-post (yearly) question:</i> On a scale form “very high” to “very low or none”: 6. Please indicate the uniformity of effects of the solution in the past 12 months.</p> <p>T4a. as well as T4b. can be answered by individual companies as well as by park managers. Answers have to be collected separately and coded (5 = “very high” to 1 = “Very low or none”). A single average value is calculated using to the procedure described in Section 1.1. Answers from companies are added up and divided by the total number of companies that provided answers so as to arrive at a single value for UNIFORM_COMP_t. Answers from park manager are stored separately as UNIFORM_PARK_t.</p> $UNIFORM_COMP_t = \frac{\sum_{i=1}^I UNIFORM_COMP_{i,t}}{T_COMP_t}$ <p>with</p> <p>UNIFORM_COMP_{i,t} Likert Scale items (1, ...5) reported by individual company T_COMP_t Number of companies that provided answer to T4a. and/or T4b. UNIFORM_PARK_t Likert Scale item (1, ...5) reported by park i Specific company in a park involved in the implementation of the solution I Total number of companies in a park involved in the implementation of the solution t Point in time when data is collected</p>	
Interpretation of KPI	
Very high	The solution has a uniform performance over the entire year and it is not affected by external climate conditions or rate of production activities.
High	The solution has an overall uniform performance over the entire year. Fluctuations related to external climate conditions or rate of production activities are expected/registered in less than 2 months per year.
Medium	The solution performance varies over the entire year. Fluctuations related to external climate conditions or rate of production activities are expected/registered in less than 4 months per year.
Low	The solution performance varies significantly over the entire year. Fluctuations related to external climate conditions or rate of production activities are expected/registered during most of the year.
Very low or none	The solution performance is not uniform along the year and it is in some cases unpredictable, making it complicated to plan the activities within the park.
Data ...	

... Recording	Answers are recorded by person responsible for survey/questionnaire
... Storage	Answers are stored by person responsible for survey/questionnaire
... Sharing	Value of UNIFORM_COMPt and UNIFORM_PARKt are shared; individual values are not shared.
... Protection	No obvious data sensitivity present.
Definitions	
Seasonality	a pattern, variation, or fluctuation that is correlated with a season, day of the week, or other period of time
Uniformity	Performance of solution is constant/undeviating over a pre-defined period (year)