Developing an indicator-based sustainability assessment framework for office appraisal.

Exploring ways to integrate sustainability into appraisals

TU Delft

Overview

Motivation

- Background
- Problem field
- Research question

Methodology

- Literature review
- Semi-structured interviews
- Online survey
- Expert interview

Findings & Results

- Final set of indicators
- Importance of indicators
- Barriers

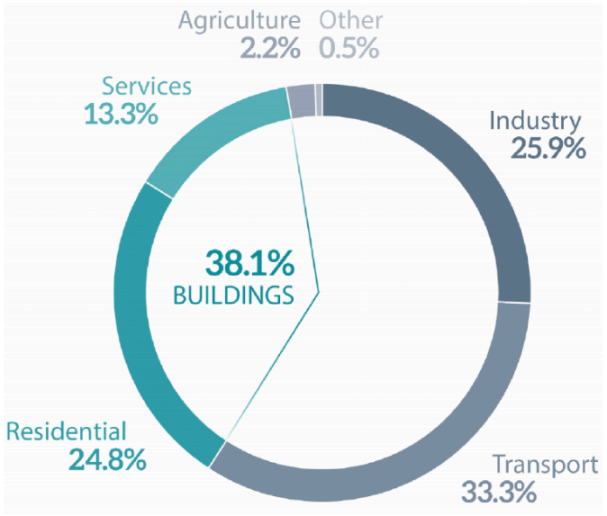
Conclusion & Discussion

- Proposed framework
- Reflection
- Discussion

Need for sustainable development

Why ’sustainable development’?

Cause of the challenges and issues



Problem field

Problem field

Costs:
Investment costs
Payback period

Benefits:
Split-incentive issue
Not profitable

Added value:
Interested in the
Added value

''So... what is the value of the sustainable characteristics of my poperty?''

Problem field

Guidelines:
Missing
Recommendations
Could vs Should

Options:
Existing rating tools
Time-consuming
Expensive

Definition:
Sustainability
Characteristics
Goals

Implementation:
Relationship
Sustainability
Valuation

'' Which sustainabilty characteristics and methods?''

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'' Which sustainabilty characteristics and methods?''

''So... what is the value of the sustainable characteristics of my poperty?''

Problem field

There is a need for a validated sustainability assessment framework for offices which can be performed by appraisers in a manageable way, keeping in mind the **available resources,** but still **encompassing all relevant** aspects of sustainability.

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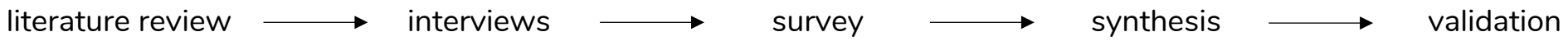
There is a need for a validated sustainability assessment framework for offices which can be performed by appraisers in a manageable way, keeping in mind the **available resources,** but still **encompassing all relevant** aspects of sustainability.

In which way can an appraiser assess the sustainability performance of offices for appraisal?

Research Design



Methodology

literature review → interviews → survey → synthesis → validation

- Which sustainability indicators should be included in the assessment & how to measure?
- Which valuation methods allow the incorporation of sustainability aspects?

- Preliminary selection of indicators
- Selection of valuation method

Methodology

literature review → interviews → survey → synthesis → validation

- Which sustainability indicators should be included in the assessment & how to measure?

- First selection of indicators & measurement

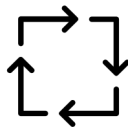
Methodology

literature review → interviews → survey → synthesis → validation

- Which sustainability indicators should be included in the assessment & how to measure?
- What is the relevance of the assigned points to the overall score?
- Final selection of the indicators & measurement
- Ranking of the indicators

Methodology

literature review → interviews → survey → synthesis → validation

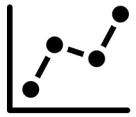


- How can the financially added value of the indicators be determined for appraisal?

- Linking the indicators to the appraisal

Methodology

literature review → interviews → survey → synthesis → validation



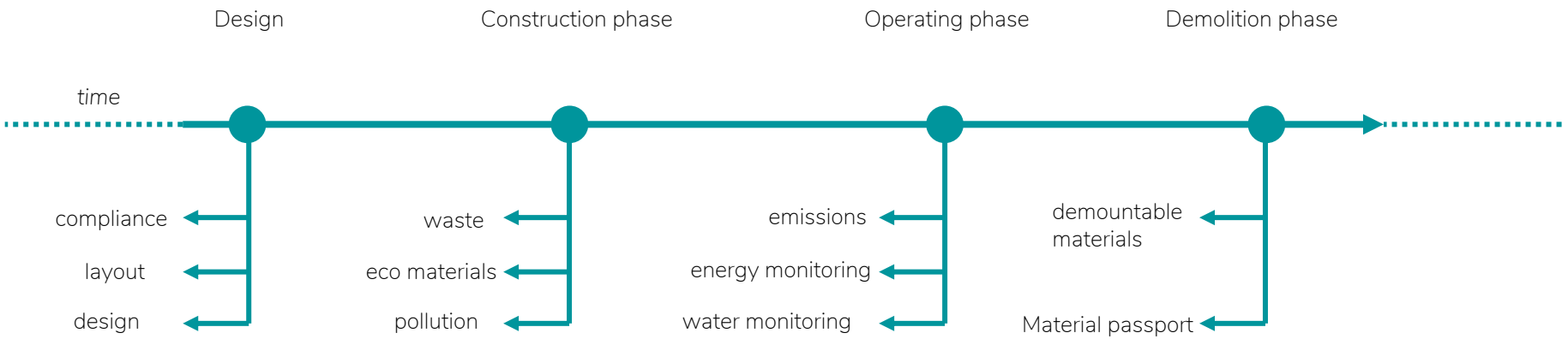
- How can the financially added value of the indicators be determined for appraisal?

- Validation of the linkage between indicators and appraisal by an expert

- Future recommendations

Literature review – indicators arising from theory

What is a sustainable office?



Literature review

Which valuation methods?

The task of an appraiser is to provide an estimation of the market value

The discounted cash flow method is the most suitable for integrating sustainability aspects

Market rent *Rental growth* *Occupancy* *Vacancy* *Operating costs* *Discount rate*

& more

Literature review

Reflecting sustainability in valuations is not a development of valuation approaches, but a development in the application of the methods.

Semi-structured interviews – indicators confirmed

- 8 sustainability experts, experience with commercial RE
- Preliminary selection of indicators presented
- Reduction made from 43 indicators to 35 indicators

What is a sustainable office?

Semi-structured interviews

''Think it starts with realizing that we are depleting the Earth. And, that depletion of the earth immediately follows in which order your buildings should be made more sustainable''
(interviewee 8)

''Buildings are never truly sustainable, they always use energy, materials and water. What you can do is make it better than the standard''
(interviewee 1)

''*legislation is for laggards*''
(interviewee 6)

Semi-structured interviews

		Sustainability Indicators	int. 1	int. 2	int. 3	int. 4	int. 5	int. 6	int. 7	int. 8	total counts
Energy	1	EPC	x	x	x			x	x	x	6
	2	share renewable energy/carbon offset	x			x		x	x		4
	3	monitoring energy use		x	x	x	x	x	x	x	7
	4	energy saving lights		x		x	x	x			4
	5	energy use of elektrcity net	x					x	x	x	4
	6	use of fossil fuels						x	x		2
	7	type of sustainable sources			x			x			2
Health	8	daylighting	x	x	x	x	x	x	x		7
	9	views	x	x	x		x	x	x		6
	10	air quality	x	x	x	x		x	x		6
	11	fresh air supply	x	x	x		x	x	x		6
	12	light regulation (presence)	x		x			x	x		4
	13	temperature regulation	x		x		x	x	x		5
	14	relaxing spaces	x		x	x	x	x	x		6
	15	acoustic comfort			x		x	x			3
Water	16	watersaving sanitary	x	x		x	x	x	x		6
	17	leak detection	x						x		2
	18	reduce use of water (public)	x		x		x	x	x		5
	19	seperate greywater / stormwater		x	x	x	x	x	x	x	7
	20	monitoring water use		x	x	x	x		x		5
Materials	21	demontable materials/parts	x		x	x	x	x			
	22	material passport	x	x	x	x	x		x	x	
	23	environmental impact materials		x	x	x	x		x		
	24	condition monitoring	x	x	x		x	x	x	x	
	25	safety measures materials		x					x		
Pollution	26	impact refrigerants			x	x	x	x	x		
	27	separate liquids			x				x		
	28	separate waste	x	x	x	x	x	x	x	x	
	29	waste collection area	x	x	x	x	x	x	x	x	
	30	emission of CO2				x	x	x	x	x	
Ecology	31	ecologic value/facilities		x	x	x	x		x	x	
	32	green facilities	x	x	x		x	x	x	x	
	33	ecologic research	x	x	x	x	x	x		x	
	34	reduce light pollution		x			x	x	x	x	
Transport	35	proximity of public transport	x	x	x	x	x		x	x	
	36	proximity of facilities	x	x			x		x	x	
	37	facilities for cyclists	x	x	x	x	x	x	x	x	
	38	pedestrians route		x			x		x	x	
	39	reduce car/park use		x	x	x	x		x	x	
Future	40	integral accessibility	x	x	x	x	x	x	x	x	
	41	adaptability of structure	x	x	x		x	x	x		
	42	adaptability of functions	x	x	x	x	x	x			
	43	urbanization of area			x			x			

Operationalization of indicators

	Indicator	Goal	Measurement	total count
5	daylighting	provide end-users sufficient daylighting	percentage of glass windows	7
6	views	provide end-users views from workplaces	end-users have views (not-disturbed) towards outside	7
7	air quality	enabling a healthy indoor environment	fresh air supply through , humidity level, CO2 emissions (inside)	6
8	light regulation	provision of light control by end-users to their comfort	workplaces contain manual light regulation	4
9	temperature regulation	provision of temperature control by end-users	presence of operable windows, thermostat, mechanic ventilation, per workplace unit	5
10	relaxing spaces	provide end-users sufficient space to take breaks	relaxing spaces inside & outside, sufficient surface	6
11	occupant satisfaction	assess the satisfaction level of indoor environment by users	post occupancy evaluation results	4

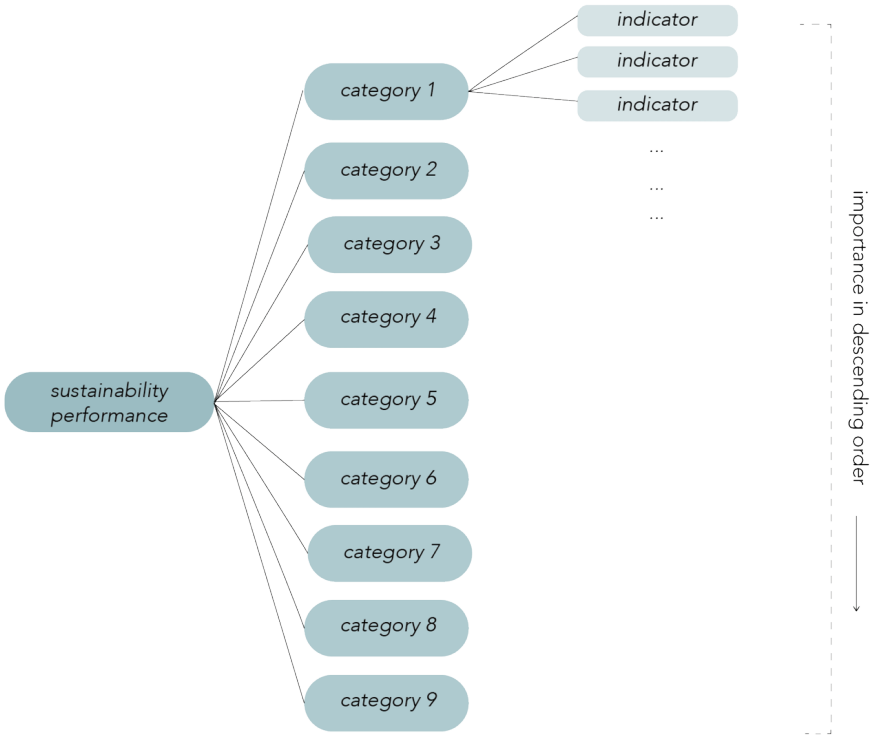
x = *input for online survey*

x = *(new) proposed indicator based on interview findings*

table x.x

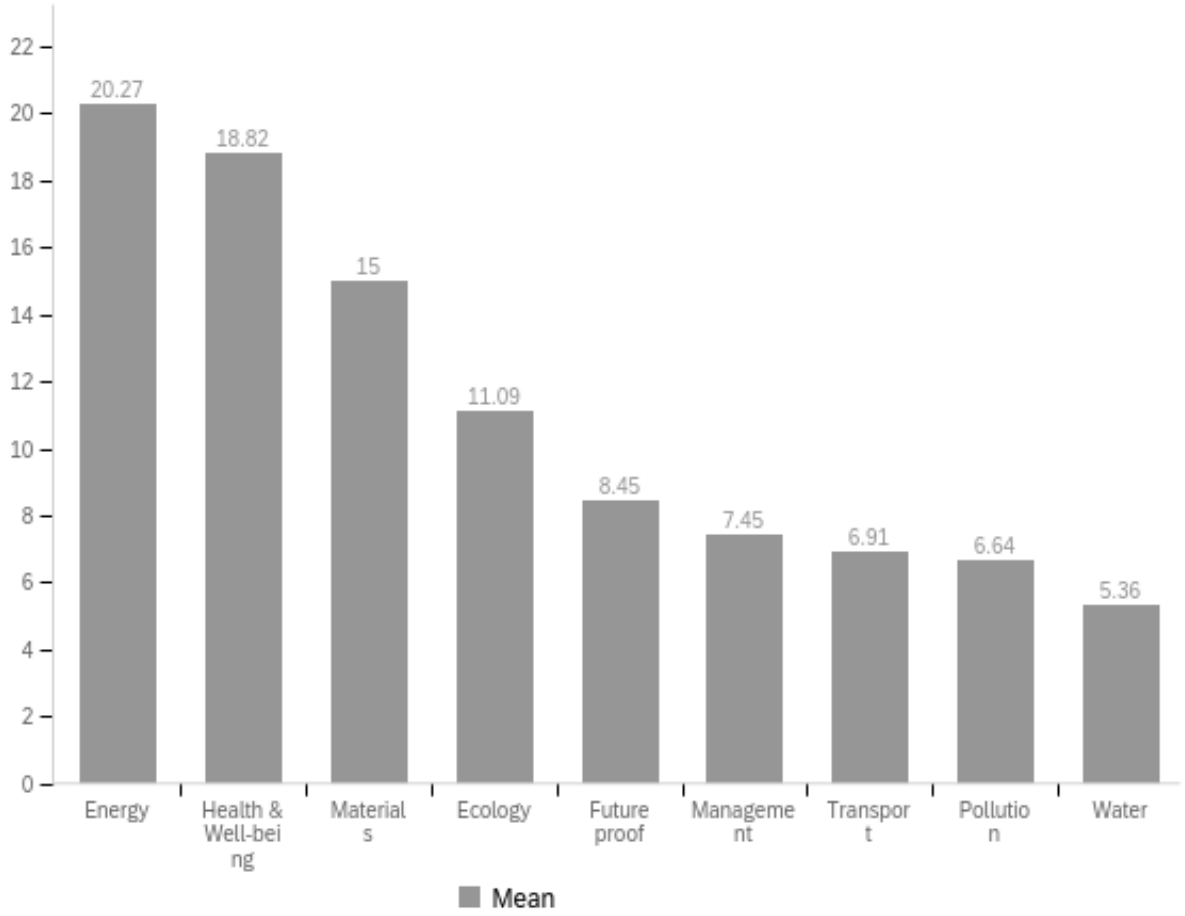
- Goal provides better understanding what the indicators address
- Measurement:
- New proposed indicators in green
- (additional) input for online survey in grey

Online Survey – final selection of the indicators



‘value tree’

Online Survey



Overview categories

Online Survey

Sustainability categories	*Weight (%)*	Sustainability indicators		Weight (%)	Final Weight
Energy	20,3	1	sustainable energy sources	29	5,9
		2	EPC	24,5	5,0
		3	monitoring energy use	24,2	4,9
		4	commisioning	22,4	4,5
Health	18,8	5	air quality	28,9	5,4
		6	daylighting	19,7	3,7
		7	temperature control	14,1	2,7
		8	relaxing spaces	13,9	2,6
		9	views from workplaces	12,7	2,4
		10	light regulation	10,6	2,0
Materials	15,0	11	environmental impact	29,6	4,4
		12	demountable materials	26,4	4,0
		13	material passport	23,8	3,6
		14	condition monitoring	20,2	3,0
Ecology	11,1	15	ecological facilities	35,5	3,9
		16	green facilities	32,6	3,6
		17	ecologic value	31,9	3,5
Future proof	8,5	18	adaptability of functions	37,7	3,2
		19	adaptability of structure	32,9	2,8
		20	integral accessibility	29,4	2,5
Manag.	7,5	21	roadmap towards sustainability	56,7	4,3
		22	greenlease	43,3	3,2
Transport	6,9	23	reduced car park/use	28,6	2,0
		24	proximity of public transport	28,2	1,9
		25	facilities for cyclists	27,7	1,9
		26	proximity of facilities	15,6	1,1
Pollution	6,6	27	separate waste collection	38,5	2,5
		28	monitoring emissions	28,9	1,9
		29	light pollution (reduce)	16,4	1,1
		30	flood measures	16,3	1,1
Water	5,4	31	monitoring water consumption	27,6	1,5
		32	water saving sanitary	26,8	1,4
		33	reuse collected water	23,7	1,3
		34	separate grey&stormwater	21,9	1,2

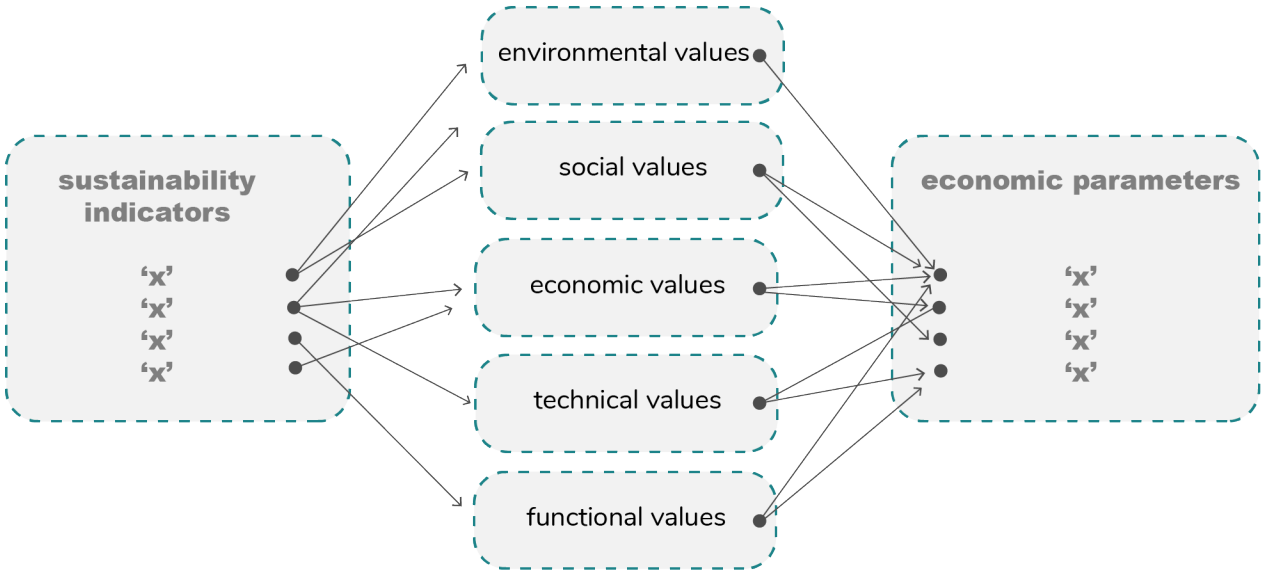
Synthesis (framework)

literature review → interviews → survey → synthesis → validation

Synthesis (framework)

The **value** *of properties is linked to the* **needs and interests** *of different market players, such as the owners and users. For this reason, the valuation process of properties is always closely related to market participant's* **value systems** *and consequently influence the economic value of properties in the* **marketplace** *(Lorenz & Lutzkendorf, 2014).*

Approach


environmental values
social values
economic values
technical values
functional values
sustainability indicators
'x'
'x'
'x'
'x'
economic parameters
'x'
'x'
'x'
'x'
ch 02/05/06 influenced by
climate targets
policies
regulations
ch 04 shaped by
perceptions
demand & supply
preferences
ch 03 affected by
appraisers' knowledge
available data

Approach

		energy consumption	water	waste	Healthy environment	CSR / image	flexibility & adaptability	durability	compliance	resilience	marketability	rent	rental growth	operating costs	occupancy	vacancy	renewal prop.	discount rate	insurance	exit value
1	sustainable energy sources	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x		x
2	EPC	x			x	x			x		x	x	x	x	x		x	x		x
3	monitoring energy use	x			x	x			x				x	x						

x direct/high impact
x indirect/low impact

performance & quality indicators

impact on value systems

adjustable parameters

Approach

		energy consumption	water	waste	Healthy environment	CSR / image	flexibility & adaptability	durability	compliance	resilience	marketability	rent	rental growth	operating costs	occupancy	vacancy	renewal prop.	discount rate	insurance	exit value
18	adaptability of functions					×	×	×			×	×	×		×	×	×	×		×
19	adaptability of structure					×	×	×			×	×	×		×	×	×	×		×
20	integral accessibility					×	×	×	×		×		×		×		×			
21	roadmap towards sustainability	×	×	×	×	×	×		×		×	×	×	×	×	×	×			
22	greenlease	×	×	×		×					×	×	×	×	×	×				

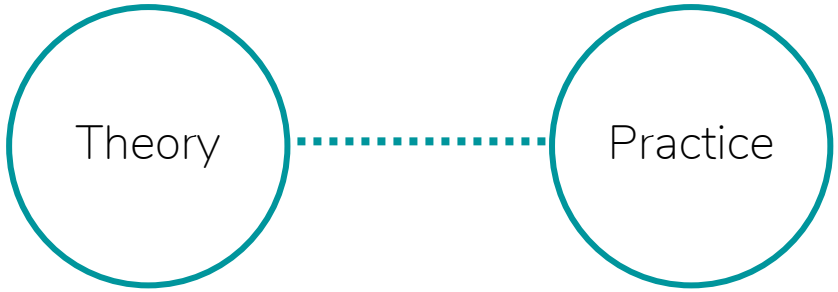
× direct/high impact
× indirect/low impact

performance & quality indicators

impact on value systems →

adjustable parameters →

Expert interview



Expert interview

x direct/high impact
x indirect/low impact

		rent	rental growth	operating costs	occupancy	vacancy	renewal prop.	discount rate	insurance	exit value
1	sustainable energy sources	x	x	x	x	x	x	x		x
2	EPC	x	x	x	x		x	x		x
3	monitoring energy use		x	x						
4	commisioning			x				x	x	x
5	air quality		x		x	x	x			
6	daylighting		x		x	x				
7	temperature control		x		x	x				
8	relaxing spaces		x		x	x				
9	views from workplaces		x		x	x				
10	light regulation		x		x	x				
11	environmental impact materials							x	x	x
12	demountable materials				x	x	x	x		x
13	material passport				x	x		x		x
14	condition monitoring		x	x				x	x	x
15	ecological facilities	x	x		x	x	x			
16	green facilities	x	x		x	x	x			
17	ecologic value	x			x	x				
18	adaptability of functions	x	x		x	x	x	x		x
19	adaptability of structure	x	x		x	x	x	x		x
20	integral accessibility		x		x		x			
21	roadmap towards sustainability	x	x	x	x	x	x			
22	greenlease	x	x	x	x	x				
23	reduced car park/use	x	x		x	x	x			
24	proximity of public transport	x	x		x	x	x	x		x
25	facilities for cyclists	x	x		x	x	x			
26	proximity of facilities	x	x		x	x	x			
27	separate waste collection			x						
28	monitoring emissions		x		x	x	x		x	
29	light pollution (reduce)									
30	flood measures								x	
31	monitoring water consumption			x						
32	water saving sanitary		x	x						
33	reuse collected water		x	x						
34	separate grey&stormwater		x	x					x	

performance & quality indicators → adjustable parameters

Expert interview

‘EPC’ indicator

In current practices it seems that only the indicators EPC (labels) have a direct impact on the market value of an office.

Impact through corrections made, these corrections are the Investments costs for sustainable upgrades. Also through discount rate & exit yield (risk)

The indicator ‘EPC’ impacts the comfort level of the end-users, thus an indirect impact according to the appraiser, which can be reflected with the occupancy & vacancy

Expert interview

Health & Well-being indicators

Importance of air quality was confirmed

However, an appraiser would not assess the impact of the indicators on the health of end-users

Impact on health such as absenteeism, productivity, is already discounted in WELL scores

x direct/high impact
x indirect/low impact

		rent	rental growth	operating costs	occupancy	vacancy	renewal prop.	discount rate	insurance	exit value
1	sustainable energy sources	x	x	x	x	x	x	x		x
2	EPC	x	x	x	x		x	x		x
3	monitoring energy use		x	x						
4	commisioning			x				x	x	x
5	air quality		x		x	x	x			
6	daylighting		x		x	x				
7	temperature control		x		x	x				
8	relaxing spaces		x		x	x				
9	views from workplaces		x		x	x				
10	light regulation		x		x	x				
11	environmental impact materials							x	x	x
12	demountable materials				x	x	x	x		x
13	material passport				x	x		x		x
14	condition monitoring		x	x				x	x	x
15	ecological facilities	x	x		x	x	x			
16	green facilities	x	x		x	x	x			
17	ecologic value	x			x	x				
18	adaptability of functions	x	x		x	x	x	x		x
19	adaptability of structure	x	x		x	x	x	x		x
20	integral accessibility		x		x		x			
21	roadmap towards sustainability	x	x	x	x	x	x			
22	greenlease	x	x	x	x	x				
23	reduced car park/use	x	x		x	x	x			
24	proximity of public transport	x	x		x	x	x	x		x
25	facilities for cyclists	x	x		x	x	x			
26	proximity of facilities	x	x		x	x	x			
27	separate waste collection			x						
28	monitoring emissions		x		x	x	x		x	
29	light pollution (reduce)									
30	flood measures								x	
31	monitoring water consumption			x						
32	water saving sanitary		x	x						
33	reuse collected water		x	x						
34	separate grey&stormwater		x	x					x	

performance & quality indicators — adjustable parameters → — confirmed/acknowledged by appraiser*

Expert interview

Materials indicators (circularity)

The indicators 'demountable materials' together with 'environmental impact materials' & 'material passport' are difficult to quantify

Impact through slower/reduced depreciation

Investor might be willing to pay more due to circular characteristics, less investment required

		rent	rental growth	operating costs	occupancy	vacancy	renewal prop.	discount rate	insurance	exit value
1	sustainable energy sources	x	x	x	x	x	x	x		x
2	EPC	x	x	x	x		x	x		x
3	monitoring energy use		x	x						
4	commisioning			x				x	x	x
5	air quality		x		x	x	x			
6	daylighting		x		x	x				
7	temperature control		x		x	x				
8	relaxing spaces		x		x	x				
9	views from workplaces		x		x	x				
10	light regulation		x		x	x				
11	environmental impact materials							x	x	x
12	demountable materials				x	x	x	x		x
13	material passport				x	x		x		x
14	condition monitoring		x	x				x	x	x
15	ecological facilities	x	x		x	x	x			
16	green facilities	x	x		x	x	x			
17	ecologic value	x			x	x				
18	adaptability of functions	x	x		x	x	x	x		x
19	adaptability of structure	x	x		x	x	x	x		x
20	integral accessibility		x		x		x			
21	roadmap towards sustainability	x	x	x	x	x	x			
22	greenlease	x	x	x	x	x				
23	reduced car park/use	x	x		x	x	x			
24	proximity of public transport	x	x		x	x	x	x		x
25	facilities for cyclists	x	x		x	x	x			
26	proximity of facilities	x	x		x	x	x			
27	separate waste collection			x						
28	monitoring emissions		x		x	x	x		x	
29	light pollution (reduce)									
30	flood measures								x	
31	monitoring water consumption			x						
32	water saving sanitary		x	x						
33	reuse collected water		x	x						
34	separate grey&stormwater		x	x					x	

x direct/high impact
x indirect/low impact

performance & quality indicators — adjustable parameters → — confirmed/acknowledged by appraiser*

Expert interview

Future proof indicators

'Adaptability of functions' is currently addressed in appraisals. However, the zoning plan has an impact on the adaptability.

Impact through reduced vacancy periods, 1-9 months

Impact through discount rate & exit yield

		rent	rental growth	operating costs	occupancy	vacancy	renewal prop.	discount rate	insurance	exit value
1	sustainable energy sources	x	x	x	x	x	x	x		x
2	EPC	x	x	x	x		x	x		x
3	monitoring energy use		x	x						
4	commisioning			x				x	x	x
5	air quality		x		x	x	x			
6	daylighting		x		x	x				
7	temperature control		x		x	x				
8	relaxing spaces		x		x	x				
9	views from workplaces		x		x	x				
10	light regulation		x		x	x				
11	environmental impact materials							x	x	x
12	demountable materials				x	x	x	x		x
13	material passport				x	x		x		x
14	condition monitoring		x	x				x	x	x
15	ecological facilities	x	x		x	x	x			
16	green facilities	x	x		x	x	x			
17	ecologic value	x			x	x				
18	adaptability of functions	x	x		x	x	x	x		x
19	adaptability of structure	x	x		x	x	x	x		x
20	integral accessibility		x							
21	roadmap towards sustainability	x	x	x	x	x	x			
22	greenlease	x	x	x	x	x				
23	reduced car park/use	x	x		x	x	x			
24	proximity of public transport	x	x		x	x	x	x		x
25	facilities for cyclists	x	x		x	x	x			
26	proximity of facilities	x	x		x	x	x			
27	separate waste collection			x						
28	monitoring emissions		x		x	x	x		x	
29	light pollution (reduce)									
30	flood measures								x	
31	monitoring water consumption			x						
32	water saving sanitary		x	x						
33	reuse collected water		x	x						
34	separate grey&stormwater		x	x					x	

x direct/high impact
x indirect/low impact

performance & quality indicators — adjustable parameters → — confirmed/acknowledged by appraiser*

Expert interview

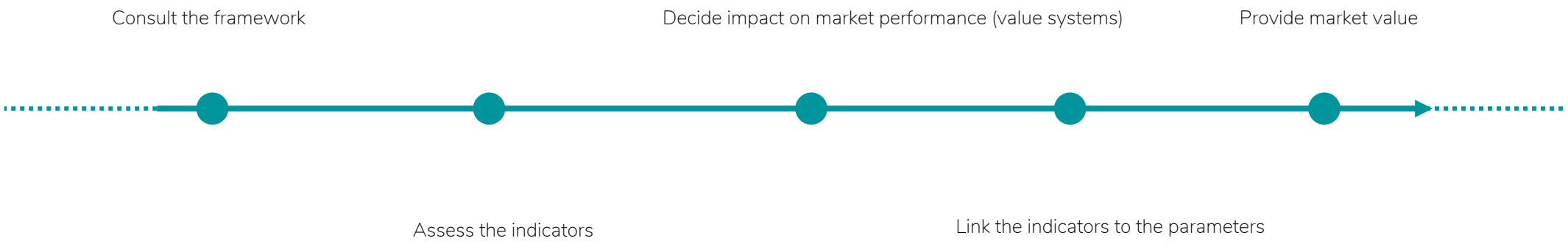
You actually have a different concept of value. We are talking about market value, but that is based on the rent and rental value capitalization.
(appraiser)

What kind of building the tenant is in is not considered at all, that is not so decisive in the valuation.
(appraiser)

The most important thing is that you start looking at value in a different way, so the economic value of your building.
(appraiser)

Conclusion

In which way can an appraiser assess the sustainability performance of offices for appraisal?

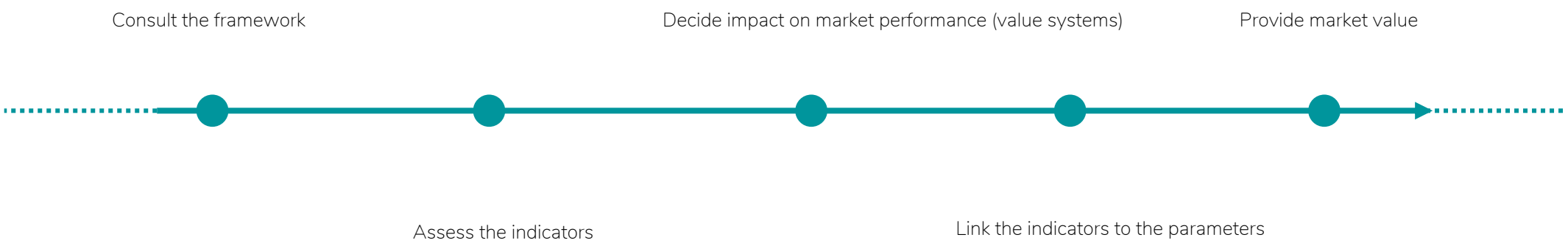


Discussion

Limitation 1: missing base values to reduce subjectivity

Limitation2: theoretical linkage between indicators and parameters

Limitation3: Devaluing effect of the indicators (compliance)

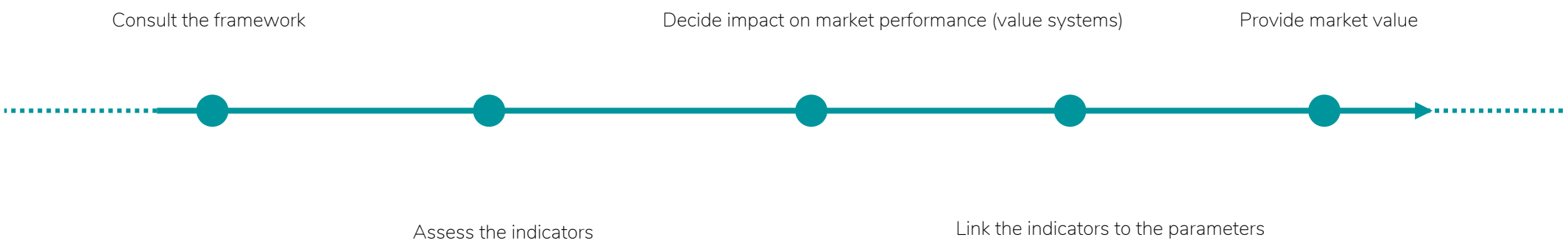


Discussion

Recommendation 1: complement framework by base values

Recommendation 2: expand the evidence on the (theoretical) linkage

Recommendation 3: address the devaluing effect to stimulate investments



Discussion

''Reflecting sustainability in valuations is not a development of valuation approaches, but a development in the application of the methods''

Financial value
- *Focus on private entities*
- *Derived from market analysis*
- *Rental agreement / situation*

Economic value
- *Focus on society as a whole*
- *Derived from building performance*
- *Fitness for use*

Thank you