

Inputs to BREEAM-NOR 2021

Interest in and opportunities for the construction of sustainable buildings have exploded in recent years. BREEAM has achieved a solid foothold in Norway and has become the country's most used environmental certification for buildings. The BREEAM-NOR manual is a tool for building and documenting good quality structures with a focus on the environment and sustainability.

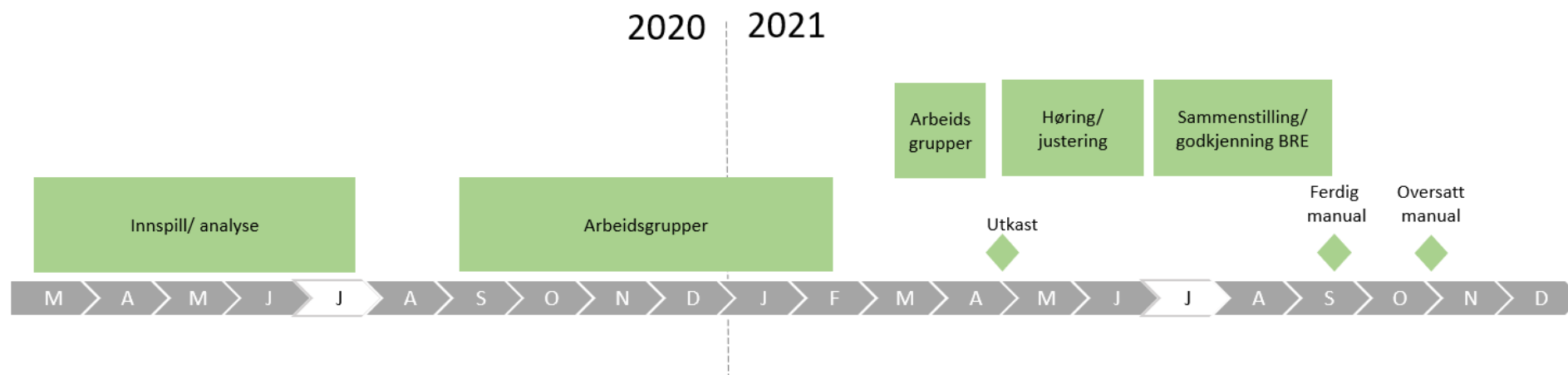
BREEAM-NOR 2021 is intended to reflect every aspect of current best practice in Norway and to drive new thinking in planning and construction for the environment and enhanced sustainability. BREEAM-NOR needs to be well designed, and its development processes need to embody wide support and commitment from the business community.

With this in mind, an input and analysis phase relating to BREEAM-NOR was executed in spring and autumn of 2020, with the participation of more than 500 persons from the building construction and real estate industries. This report analysis the trends which affect the manual, and summarises the inputs received through meetings, dialogue, e-mail contributions and other communication. In addition the BREEAM manuals from other countries have been analysed for further inspiration for our own manual.

The report is intended as a basis for future work on updating the BREEAM-NOR manual.

Time schedule for updating BREEAM-NOR

Summary of inputs to BREEAM-NOR 2021



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1 BREEAM-NOR as a certification scheme

This is a summary of all comments, inputs and suggestions received concerning BREEAM-NOR as a certification scheme.

1.1 Anticipated changes to the international manual

BREEAM-NOR is based on the international BREEAM manual. This too is in the process of being updated, and BRE has announced major changes to BREEAM International which will also influence BREEAM-NOR:

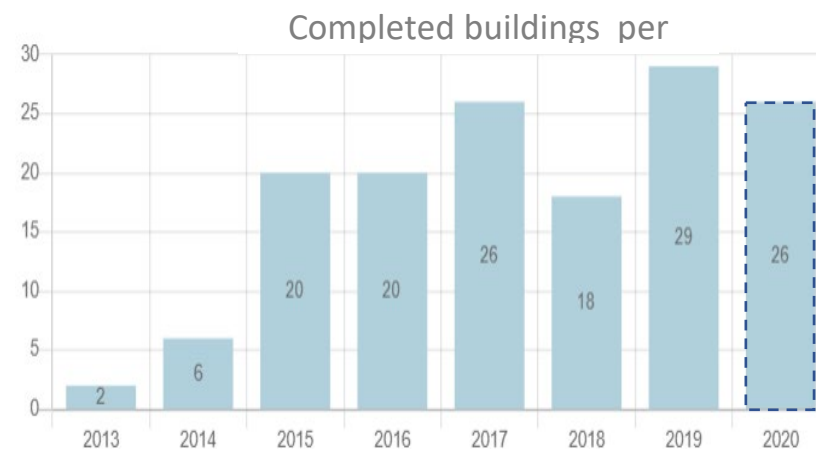
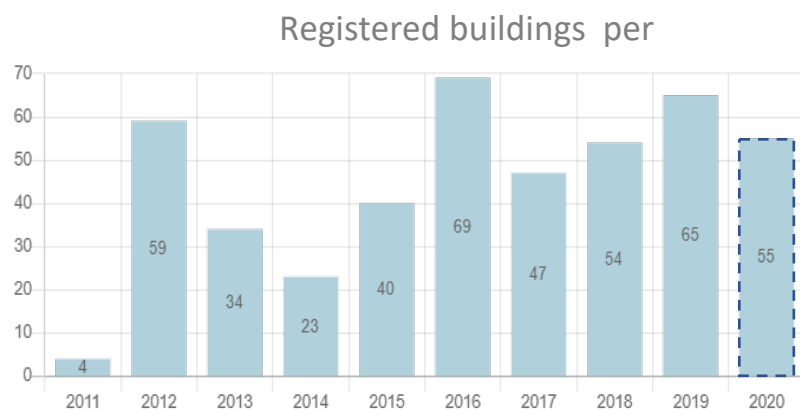
- Better coordination between the different BREEAM manuals, for example, by means of BREEAM In-Use
- Improved customer journey
- Improved KPIs and statistics
- A greater number of standard building types
- Less technical language
- Clearer arrangement/structure: BRE is planning a better layout

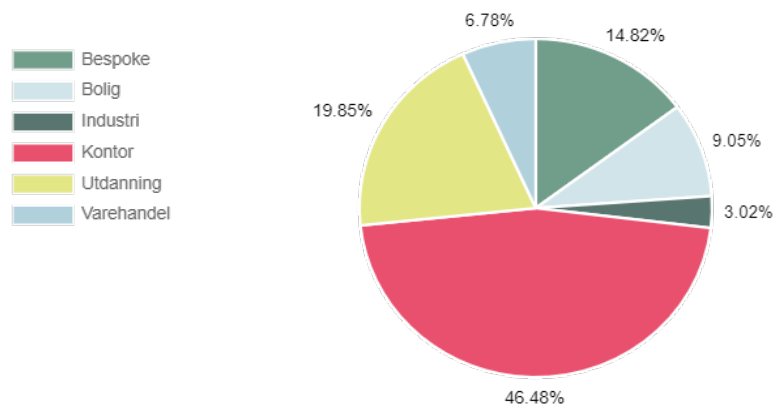
1.2 Trends, analysis and reports

- Inputs regarding requirement levels, weighting and minimum requirements:
 - 'Paris proof' concept, Norwegian Green Building Council. Possible starting point for minimum requirements for climate impact of buildings.
 - The EU taxonomy for sustainable finance has certain minimum requirements for buildings to allow their definition as sustainable and eligible for green loans.
 - Green Deal 2019. EU's green growth strategy. How to achieve the goal of climate neutrality in 2050? An umbrella for many subsidiary plans and strategies. Key words: climate legislation, greenhouse gas reduction plans, climate pricing of imports, action plans for circular economy, regulatory changes and stimulation of markets. There are also measures for supporting processes such as finance, budgeting, state aid systems, reporting, etc.

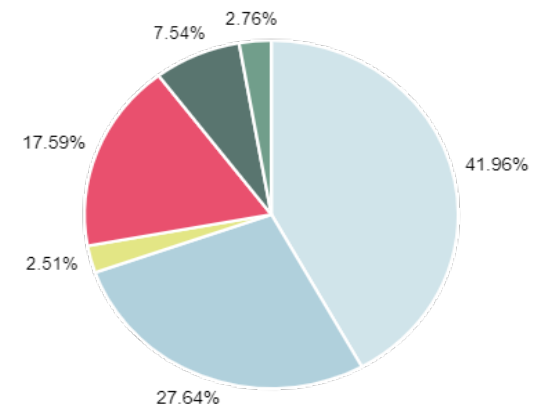
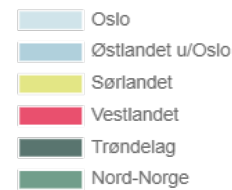
1.3 Extent of BREEAM certification in Norway

The graphs below show the development of BREEAM certification in Norway. The number of entities registering and certifying their buildings under BREEAM-NOR has increased year by year. The statistics are from September 2020.





Type of building accumulated for all registered projects



Geographical breakdown accumulated for all registered projects

1.4 Proportion of BREEAM-NOR buildings in Norway

The table below shows that BREEAM-NOR is still just a fraction of all new-builds in Norway. Homes were first included in the manual in 2016. The figures are from Statistics Norway's building statistics. Homes and industrial are the lowest, while coverage is greatest for office buildings. However, the table shows that the proportion of office buildings receiving BREEAM-NOR certification has rapidly reduced since 2017, despite stable construction volumes.

m ² completed per year	2019			2018			2017		
	BREEAM-NOR	Norway	Percentage share	BREEAM-NOR	Norway	Percentage share	BREEAM-NOR	Norway	Percentage share
Homes	12,500	2,045,860	0.6	5,129	2,242,946	0.2	-	2,017,474	-
Offices	90,480	368,836	24.5	130,963	299,629	43.7	206,518	383,378	53.9
Retail	18,017	540,468	3.3	-	505,416	-	4,148	429,041	1.0
Industrial	16,100	1,094,245	1.5	-	1,008,208	-	-	937,748	-
Educational buildings	19,220	394,994	4.9	1,134	455,148	0.2	9,029	425,646	2.1
TOTAL	156,317	4,444,403	3.5	137,226	4,511,347	3.0	219,695	4,193,287	5.2

1.5 Survey regarding BREEAM and sustainable building

In Spring 2020, a survey was carried out into the advantages and disadvantages of BREEAM and the characteristic qualities of sustainable buildings. Real estate developers, Advisory Professionals (APs), assessors and project managers were asked for their views.

1.6 Top five...

All respondents were asked to list their top five from a long list of attributes pertaining to BREEAM-NOR. The following gives a summary of the replies:

Five most important positive outcomes of BREEAM certification:

1. Good reputation for developer and project team
2. Better health for users (indoor climate, degassing, natural light, etc.)
3. Fewer hazardous materials in the building
4. Lower energy consumption
5. Easier to rent or sell

Better financing opportunities was also rated highly by several of the responding groups.

Five most pressing challenges/problems with the current manual:

1. It leads to higher process costs (cost of project control, excluding AP and assessor).
2. Excessive documentation requirements
3. Criteria are hard to understand and thus anticipate.
4. Project team and contractor know too little about BREEAM-NOR.
5. This leads to higher construction costs (dearer building solutions).

Five most important characteristics of a sustainable building:

1. Healthy indoor climate
2. Low greenhouse gas emissions compared to a reference building
3. Contribute to improved biodiversity/natural life in built-up areas
4. Well designed for cycling or transport options other than cars
5. Minimum energy class B

1.7 How easy is it to meet the BREEAM-NOR certification levels?

The BREEAM-NOR certification levels have been set according to the following principles:

1. Outstanding: Fewer than the top 1% of buildings (innovator)
2. Excellent: Top 10% of buildings (best practice)
3. Very Good: Top 25% of buildings (advanced good practice)
4. Good: Top 50% of buildings (intermediate good practice)
5. Pass: Top 75% of buildings (standard good practice)

The table below shows the breakdown of BREEAM-NOR 2016 certificates in isolation. The proportion of Very Good and Excellent certificates is very high compared to the above principles. It is harder to say if the lower levels are too low, as the principles dictate that the projects (for example 75% of the projects) **must be capable** of achieving the Pass level. How much effort the projects wish to put in is another question. The results could indicate that it might be beneficial to raise the threshold for achieving the Pass level, with additional minimum requirements.

	Pass	Good	Very Good	Excellent	Outstanding
Completed	1		12		
Project design		1	17	15	1
Total	1	1	29	15	1
Percentage	2 %	2 %	62 %	32 %	2 %

This is confirmed by the assessors and AP's, who, in spring 2020, were asked to assess how easy it is to achieve the BREEAM certification levels. The replies are given below:

Summary of inputs to BREEAM-NOR 2021



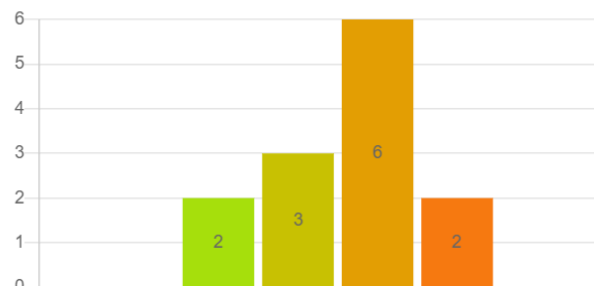
The diagram shows that Pass and Good are regarded as rather undemanding certification levels. Very Good is seen as unproblematic, while Excellent and Outstanding require more planning and supervision.

1.8 Why do real estate developers seek certification?

In spring 2020, real estate developers in our Green Expert Forum were asked various questions about whether they seek certification, and, if so, why. Here are the replies:

1. I hvor stor grad BREEAM-sertifiserer dere byggene deres?

Svar	Antall
Vi sertifiserer ikke, og skal ikke sertifisere i fremtiden	0
Vi sertifiserer ikke, men har planer om å begynne	2
Vi sertifiserer noen få bygg	3
Vi sertifiserer de fleste bygg	6
Vi sertifiserer alle bygg	2

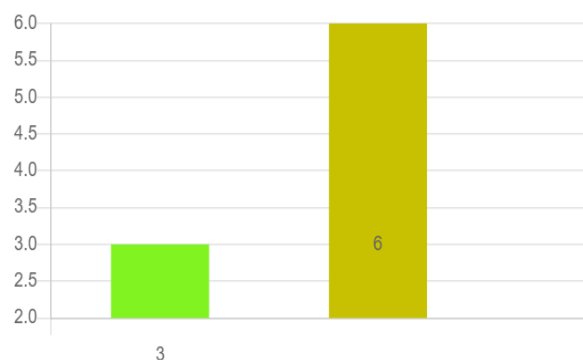


1.9 Feedback from the input phase

In spring and autumn 2020, the Norwegian Green Building Council held numerous meetings to gather input for the new manual. There were two main questions:

3. Hvorfor ønsker dere å sertifisere byggene etter BREEAM-NOR?

Svar	Antall
Frodi vi har et vedtak om det	3
Fordi markedet etterspør det	2
Fordi det er et godt verktøy for å nå miljømålene våre	6
For å få verifisert av tredjepart at vi bygger de kvaliteter som BREEAM legger opp til.	1
Bedre lånebetingelser	1



- What is working well or not so well in the current manual?
- What are your wishes for the new manual?

More than 500 persons took part, and a large number of useful inputs were received, though for practical reasons, not all of them can be mentioned below. The following are some of the most important feedback responses, broken down by chapter issues.

Issue	Input
Effect of BREEAM-NOR	Easier to rent and sell
	Fewer errors in the construction phase
	The process is more structured.
	Good characteristics are incorporated at an early stage.
	Requires a higher degree of quantified information about costs and advantages

Issue	Input
	BREEAM is an all-round concept. This means that no issue overshadows another, but all are equally important.
	BREEAM is more binding than an environmental follow-up programme.
	Levels lower than Excellent are achievable by all.
	Guarantees good quality, easy to impose requirements, good reference
	Good tool, appropriate quality, right level of quality control, marketing, economically respectable, better financing options
	Uses less energy, resilience, eligibility for green loans, in demand by tenants, better overview for environmental and energy monitoring
	Homes: end user is more interested in products than processes, hard to market for domestic buildings. Materials need greater focus.
	Have had most contact with smaller and medium-sized municipalities. Some find BREEAM to be over-comprehensive.
	BREEAM means that the environment is considered from the start, and that the contractor is on board. Important counterweight/additional emphasis to traditional attitudes/trade practices. Players are good at fixing the requirements
	Gives a clearer understanding of environmental control in the project. Suppliers are used to it.
	BREEAM helps to achieve strategic goals for healthy and profitable business and is a means of creating business development.
	The strength of BREEAM-NOR as a tool is clearly the breadth of its action categories and the opportunities for adapting to local conditions.
The certification process	One problem is that the assessors sometimes interpret the requirements in different ways.
	The documentation needs to be simplified.
	Big difference in expertise between clients. Many of them don't understand what the BREEAM requirements mean for the project.
	Many of them think that BREEAM is a verification scheme, not a process tool.
	Lack of transition to operation. How will the building be operated once it is completed?
	Long turnaround time to get the certificate
	BREEAM In-Use for communication between assessor and BRE – use it as inspiration
	During the project period, communication between the BREEAM players is sometimes lacking, with responsibility falling on the client.

Issue	Input
	Current requirements, e.g. regarding specification of requirements, do not fit all contract forms. In a turnkey contract where solutions are not fixed at an early stage and project design goes hand in hand with construction, it may be difficult to produce a locked specification of requirements with the level of detail required by BREEAM.
BREEAM documentation	Able to document a high level of quality of construction
	Higher digitalisation may have a positive effect.
	BREEAM requirements are seen as rather different from those on the market. What the actual current requirements are (from the authorities) and what BREEAM is requiring in addition (clear baseline and BREEAM's additions).
	Wish that BREEAM included models, or at least examples, of how the documentation might look. Many find that the documentation requirements are harder and more extensive than necessary.
	There is a widespread desire for the Green Building Council to provide examples of good solutions, e.g. good window solutions which allow for high daylight incidence even with sunscreens, and examples of product groups with low greenhouse gas emissions.
	The goal must be to get away from a purely paper exercise.
	A professional determines the quality of the documentation. If it isn't good enough, it may be difficult for the assessor to see whether the evidence has been provided. The assessor only needs to see that evidence has been provided and not assess the quality of the evidence.
Requests for new manual	The language used in the manual is far too technical.
	More building categories
	Health must be capable of being "sold" in a better way.
	Assessors must be more in agreement and interpret the requirements in the same way.
	Naturally enough, the players, whether clients or contractors, will choose the actions which give most effect for the money. Hence, it is important to guide efforts by targeted prioritisation through weighting and credits.
	The survey among APs and assessors shows that many issues are considered easy to understand, but even so, there are too many issues which are considered hard to understand. This needs to be tackled in the next manual.
	There is no certification option for refurbishment projects
	Aesthetic values need to be rewarded more.
	Digitalisation: facility for a form of online tool for storing all correspondence/documentation during the whole process.
	An extended form of pre-analysis tool

1.10 Other countries' BREEAM manuals

BREEAM is a worldwide certification scheme. The following is a comparison of the international BREEAM manual, the British version and the Dutch version. The latter two are of later date and may therefore contain inputs to BREEAM-NOR 2021.

Issue	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
Certification phases			
		Has introduced a third phase: Post-Occupancy stage (POS). After trial operation period (12 months).	
Building types			
		Has many further standard building types in the manual. Also has separate requirements for so-called "simple buildings" (Appendix E)	<p>Does not use "buildings", but functions or areas of use which can be certified. Examples:</p> <ul style="list-style-type: none"> • Office function • Retail function • Meeting function • Accommodation function <p>The table gives a good definition of each building type with examples. Examples of what constitutes a Bespoke process and of what cannot be certified.</p>
			Due to the above classification, a certificate may include several functions. These are called "mixed use buildings". For example office and retail. Triggers two separate certificates and processes. Weighted by m2 in the assessor tool

Building fitted out/ not fitted out			
	In three parts: <ul style="list-style-type: none"> • Fitted out • Not fitted out, but with technical plant • Not fitted out and without technical plant 	In three parts: <ul style="list-style-type: none"> • Fitted out • Not fitted out, but with technical plant • Not fitted out 	In three parts: <ul style="list-style-type: none"> • Fitted out • Not fitted out, but with technical plant • Not fitted out
		Has a detailed description of building types in an appendix	Has a good and detailed definition of a fitted-out and a not-fitted-out building. Table of building parts included in the three divisions.
Newbuild and refurbishment			
			<ul style="list-style-type: none"> • Newbuild • Extensions • Combined newbuild and refurbishment can be certified as newbuild if the newly built part is over a certain percentage of the total building. • If it is below, the newbuild and the refurbishment can either be certified separately or be given a Bespoke criterion set for both building parts.
Minimum requirements and innovation credits			
		Exemplary level credits for credit combinations: E.g. for Wst 05: Score first credits + at least 8 credits for Ene 01, one credit for Hea 07, 3 credits for Wat 01, etc.	Several minimum requirements for all certification levels. A great many from Very Good and above.

The certificate			
			Indicates innovation credits broken down into exemplary level credits and credits applied for under the certificate.
			Does not indicate the building type on the certificate.
Certification level			
		1. Outstanding: Fewer than the top 1% (innovator) 2. Excellent: Top 10% (best practice) 3. Very Good: Top 25% (advanced good practice) 4. Good: Top 50% (intermediate good practice) 5. Pass: Top 75% (standard good practice)	
Weighting			
		Different weighting depending on whether the building is fitted out or not	Different weighting depending on whether the building is fitted out or not
		Some major differences in weighting: ENE weighted 16–19 % in BREEAM-NOR LE weighted 13–10 % in BREEAM-NOR	Some major discrepancies in weighting: <ul style="list-style-type: none"> • HEA weighted 19–15 % in BREEAM-NOR • TRA weighted 6–10 % in BREEAM-NOR
Arrangement of manual			
		A number of icons are included to illustrate: <ul style="list-style-type: none"> • Scope (fitted out, not fitted out) • Innovation credits available • Minimum requirements and applicable certification level • Phase-dependent issues and criteria 	Large table on page 28 of the available criteria for different building types and scopes. There are also minimum requirements or filterable requirements.
		Context: Shows the reasons for and benefits of scoring credits.	Table 11, showing the type of evidence. Each evidence type has a code. E.g. BIM has code E2, inspection report has code E4. Does not use the codes.
		Compliance notes are in their own database, not in the manual.	

1.11 Conclusion

Most important findings and demands for change:

- The surveys show that a healthy indoor climate and low greenhouse gas emissions are felt to be the most important attributes of sustainability. These should be given extra attention when updating the manual.
- Certification levels Pass, Good and Very Good are seen as reasonably feasible. Excellent requires more effort and Outstanding is very demanding. As Very Good is for the 25 % best and Excellent for the 10% best, this suggests that these levels need tightening up.
- Many respondents comment that the BREEAM documentation requirements are very demanding. At the same time, the feedback suggests that one of the strengths of BREEAM-NOR is that the documentation requirements are clear and absolute. This will be an important factor to take into account in later work.
- Different ways of interpreting the requirements and very technical language are a problem suggested by many. The British BREEAM manual has made many simplifications which can be used as an inspiration.
- We should consider awarding innovation credits for credit combinations in order to achieve exemplary levels such as are included in BREEAM UK 2018.

Areas which should be kept as they are

- Holistic approach. Many sustainability elements are covered in BREEAM-NOR and this needs to be maintained.
- Provides assurance of actual quality – an important factor.
- A trustworthy certification scheme, recognised by the real estate and financial industries and thus an asset. This robustness needs to continue in the future.

2 Management (Man)

2.1 Anticipated changes to the international manual

No changes to this chapter have been announced in the international BREEAM manual. Note that the waste chapter will be incorporated in a new resources chapter. This may give rise to correspondences with Man 03 Responsible construction practices.

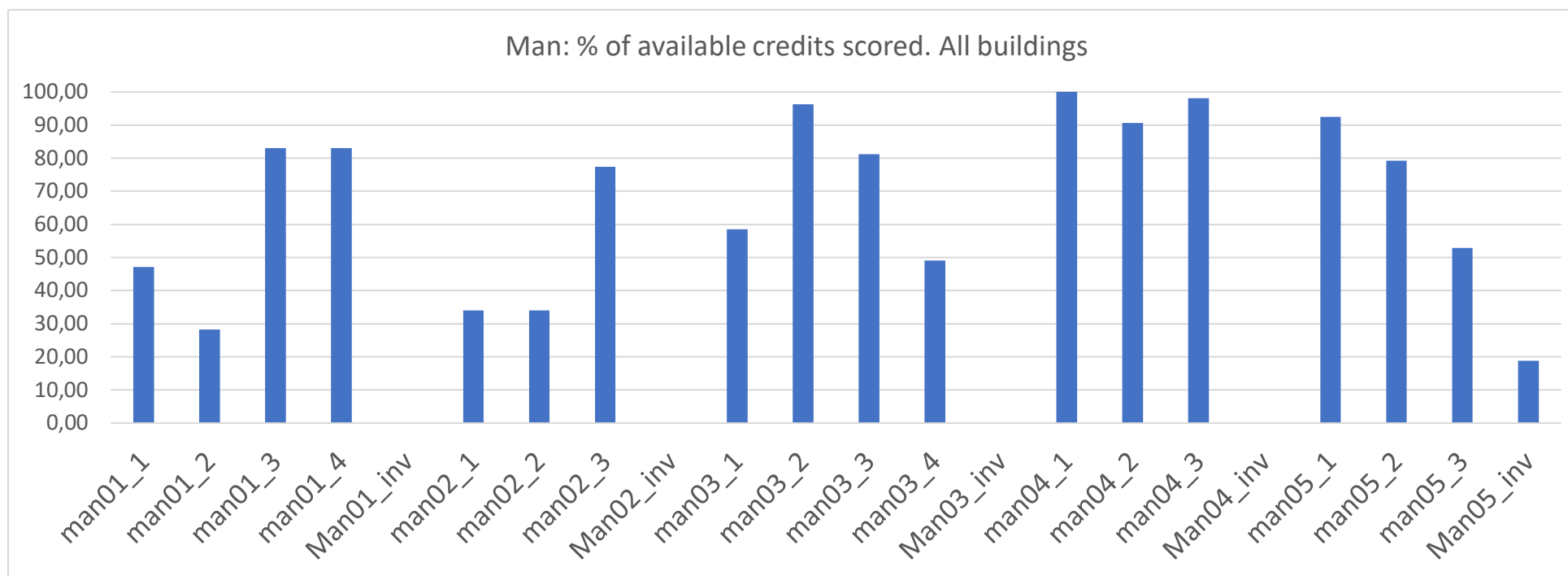
2.2 Trends, analysis and reports

- The EU taxonomy for sustainable finance has certain minimum requirements for buildings to permit definition as sustainable and eligible for green loans:
 - Must be constructed with machines that satisfies the Non-Road Mobile Machinery (NRMM) Directive
- DNV GL “Guidelines for design of fossil-free and emission-free solutions on the building site”
- Planning and construction with minimal waste. SINTEF Building Research Building Details Guide 501.101 – recently updated
- Construction Process Guidelines BREEAM-NOR parts 1 and 2, Green Building Council
 - The chapter on when in the process the resource requirement needs to be assessed
 - Colour-coded table showing when in the process each item should be executed
- Digitalisation of construction process
 - How should the process be adapted where the project uses a BIM tool?
- On 1 January 2022, the Regulation on prohibition of the use of mineral oil for heating of buildings will come into force – and will affect drying out and heating on construction sites.
- FutureBuilt’s criteria for circular construction – Chap. 3.1 environmentally based decisions on refurbishment or demolition
- Criteria for assessment of climate impact in the planning process, Oslo Municipality 2020
 - Providing quality assurance that development is as far as possible constructed in a low-carbon and climate-adapted way.
 - Contains criteria for green mobility, blue-green infrastructure, surface water, energy, recycling and materials choice and fossil-free building site
 - Fossil-free building site: · Avoiding the use of fossil energy and seeking to use low-carbon solutions in construction work and transport to and from the construction site · Reducing transport to and from the construction site · Arranging for local, low carbon earth moving

2.3 Current manual – chapter statistics

The table below shows a summary of the issues in this chapter where projects often or rarely achieve credits. Following the table is a graph showing the same per credit for each issue. The table also shows the issues which have the most frequent technical questions or clarifications or where assessors most often note a QA deviation. The table additionally shows the most important findings from a survey in which APs and assessors were asked about the individual issues in the manual.

Issue	Analysis of assessors' reports	Technical questions and clarifications and QA			Assessor and AP survey						
					Hard to interpret	Easy to interpret	Hard to achieve	Easy to achieve	Significant documentation costs	Significant execution costs	Low environmental effect
Man 01	56 %				X						X
Man 02	43 %										
Man 03	69 %	X				X					
Man 04	95 %			X							
Man 05	71 %			X							



2.4 Feedback from the input phase

In spring and autumn 2020, the Norwegian Green Building Council held numerous meetings to gather input for the new manual. There were two main questions:

- What is working well or not so well in the current manual?
- What are your wishes for the new manual?

More than 500 persons participated, and a large number of useful inputs were received, though for practical reasons, not all of them can be mentioned below. The following are some of the most important feedback responses, broken down by issues in the chapter. Half of all queries NGBC receives, whether as general questions or technical queries, relate to this chapter.

Issue	Input
Man 01	Concept development and project optimisation
General	Different APs and assessor have very different interpretations here. Some feel the subject is very simple, others difficult.
	Can the issue be made simpler by an explanation of the process?
	A document is produced which has no other purpose than BREEAM documentation.
Criterion 1 Consulting internal stakeholders	Should be a requirement that expectation setting is performed with the client in an early phase. What three goals do they have for the building?
	Clients must own the issue from stage 1 and keep their hands on the wheel to ensure that documentation is produced throughout stages 1 to 3. The client must take an early responsibility.
Criteria 2-3 Clarification of roles and responsibilities	Clarification of roles and responsibilities: Relatively simple if started early enough. Hard to match project engineering process to clarification of roles and responsibilities.
Criterion 5 Consulting external stakeholders	Uncertainty about the term “external stakeholders”- Sometimes hard to know who the future owner and operator will be, e.g. in domestic buildings.
	What is the added value of consulting external stakeholders for private developers? Not clear.
Criteria 9-14 BREEAM-NOR AP	Consider not awarding credits for having an AP? It's so dear. PM and the project design manager can assume the role.
	Having BREEAM on the agenda at the project planning meeting is not enough. It should permeate the whole process. The BREEAM progress plan and planned delivery schedule should be combined with project and progress planning.
Man 02	Life cycle costs and service life planning
General	Costs extra to use a consultant to perform the LCC analysis. Cost v. credits is too high. Not everyone sees the value of the analysis.
	Can be hard to assess who is responsible for this area. The client needs to take the lead if credits are to be achieved here. More about process design in the manual?
Criteria 1-3 LCC of building concepts	To get any benefit from this, it must be done in an extremely early phase. The client faces a challenge in intervening early enough, hard to make the choices so soon. Contractors intervene too late.
	Advantage if you can intervene at the time of site selection and volume studies, in order to be able to

Issue	Input
	document concepts of real value.
	Concept assessment should be done even earlier for increased added value. What we have now is an exercise in scraping credits together without real value. More credits could perhaps be achieved by scoring them at an early stage in the project, rather than later on.
	The good choices are often made without the aid of BREEAM. The only difference is that BREEAM helps to increase the documentation of the actual assessment.
	The issue provides a form of adult education. Not many are able to perform conceptual thinking.
Criteria 4-5 LCC of building parts	It is illogical to do this all at once at one point in the time line
	Should be building parts which provide real added value. For example, technical installations, as these are choices where LCC gives the client a real added value. LCC assessment of materials for outdoor areas often only provides limited added value.
	The section on building parts is more specific and easier to grasp for most people. Unfortunately few APs are able to design good processes here
Criterion 6 Reporting of investment costs	The cheapest credits in the manual. Unsatisfactory for the contractor to do the documentation.
Man 03	Responsible construction practices
Requests for new manual	Transport to the building site should be included. Transport of materials to and from the building site
Requests for new manual	Emission-free plant and fossil-free building site must be included. This was mentioned by many during the input round.
	Fossil/emission-free building site. Proposal for graded credit scale: 1 Fossil-free building site 2 Emission-free building site 3 Emission-free includes transport of goods to and from the building site 4 Includes transport of persons to and from the site
Requests for new manual	Building site influences the amount of waste. Must be coordinated with the resources chapter.
Requests for new manual	Proposal that the A20 list should also apply to Man 03. Must document all products and the temporary materials on the building site.
Criteria 2-3 Contractor's environmental	This requirement is important, but experienced as hard and overwhelming to understand.

Issue	Input
management	
	Several real estate investors and municipalities have broad-based control systems. It is important that the BREEAM requirements are implemented in these, so that Man 01 is not just some other scheme or just an additional scheme.
	Environmental management and good project management go hand in hand. The work is performed unsystematically and there is no tradition in the projects for documenting what has actually been done, as required by BREEAM.
	What is needed is a model layout for the BREEAM requirements, as these are often felt to be harder and more extensive than they actually are.
Criteria 4-6	Use of AP in the building phase entails relatively high costs.
Criteria 7-8 Considerate building	Some credits in checklist A1 could be better formulated/are hard to interpret. For example, how to encourage workers not to wear work clothing outside the project, checking the neighbourhood for foreign language speakers, accessibility for wheelchair users and the sight and hearing impaired, etc. Could the checklist be cut down? Some of the items are obvious. Assessor's checklist is more extensive than A1, leading to surprises at the inspection.
Criteria 10-15 Measuring energy and water consumption	Should be targets for energy and water consumption. Not just measurements, but rewards for low consumption.
Criteria 16-18 Measuring CO2 emissions from transport of building materials and waste	Regarded as very hard to achieve.
Man 04	Commissioning and handover
General	There will be extra focus on documentation and earlier planning, in terms of the technical personnel – bearing in mind that this is a BREEAM project. It will be all the better for being based on BREEAM requirements. The technical personnel have probably got away with things too easily before, but laying down a foundation for this issue gives them greater authority.
	Gives the project a high value. Leads to more attention to ITB
	The requirements are not too hard. Important credits, but demanding to document. Making a plan is good, but more should be required. Contractors say they follow the plan, but this is not always the

Issue	Input
	case.
Criterion 7 Building and domestic buildings guidelines	Can seem slightly unnecessary, often a document which is not used in practice. Could it be omitted in favour of ordinary MOM?
	Good intentions. Little practical value. The guidance on operating personnel could be omitted. Taken into account by other MOM requirements.
	Criteria 7-8 have been a challenge, with unknown tenants and a client who will be selling on once the building is complete.
Man 05	Trial operation and aftercare
	These measures could entail significant extra costs, especially for domestic buildings, because they mean more follow-up than normal after handover.
Criterion 3 Seasonal commissioning	Seasonal commissioning: Need to look at documentation requirements. Requires recertification after one year? Need to look at criteria and requirements. Needs clearer specifications. Can the issue be transferred to BIU?

2.5 Other countries' BREEAM manuals

BREEAM is a worldwide certification scheme. The following is a comparison of the international BREEAM manual, the British version and the Dutch version. The latter two are of later date and may therefore contain inputs to BREEAM-NOR 2021.

Topic	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
Man generally	BREEAM-NOR is based on this manual	The arrangement of sections is the same as BREEAM-NOR	The arrangement of sections is the same as BREEAM-NOR
Man 01			
Criteria 9-14 Role of AP		The AP's role is defined by a detailed list of tasks. Distinction between tasks in stage 1 and those in stages 2/3.	
Man 02			

Topic	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
Criteria 1-3 LCC for building		Defines requirements for a “competent person”. Done in stage 2, not in stage 3 as in BREEAM-NOR	
Man 03			
Criteria 2-3 Contractor’s environmental management		The definition of a contractor differs slightly: All parties who at any stage manage the construction site...	
Criteria 4-6 AP on the building site		The AP’s role is defined by a detailed list of tasks.	A corresponding bullet point list of the AP’s role and tasks on the building site, like UK 2018.
Checklist A1		Does not use Checklist A1, but a far simpler list in Table 4.1.	
Criteria 9-10 Measurements on the building site		Includes a requirement to set targets, but no credits for the result achieved.	
Exemplary level	An innovation credit for an exemplary level for contractors who have certified sustainable practice on the building site. The certification scheme must be approved in advance by BRE.	The exemplary level is achieved by meeting all requirements in Table 4.1.	
Man 04			
Minimum Standard			The minimum standard does not give any credits.
Man 05			
Exemplary level			1 credit The client or building occupier makes a commitment to certify the building management under a recognised

Topic	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
Assessment after occupation		The client or building occupier commits to carry out a POE exercise (see Definitions on the facing page) one year after the building is substantially occupied. This gains comprehensive in-use performance feedback. Must be performed by an independent third party.	sustainability certification scheme.

2.6 Conclusion

Most important findings and necessary changes

- Man 01 provides principles for good management practice but is initiated too late. The issue is not perceived as having value.
- Should credits be awarded if the project assesses the need for a construction activities? FutureBuilt's criteria for circular construction provide a possible method.
- It is challenging to demarcate the AP role and use resources wisely in the project. This can lead to higher costs. There is a need to define the role more clearly.
- Man 02 gives an opportunity for making good concept and material choices with a lifecycle perspective on costs. Too few projects make use of the issue. The main reason is that the exercise seems to have little value. It could possibly help to perform the analysis earlier in the process, with more client involvement.
- Man 02: We should review the credit for reporting of investment costs.
- Management requirements for contractors in Man 03 should cover requirements for fossil-free or emission-free building sites. The ban on fossil-based drying out and heating of construction sites from 2022 means that this could be a minimum requirement, at least for the higher certification levels. The Oslo Municipality criteria for the planning process could be used as a starting point.
- The building and homes user guide in Man 04 are regarded as less useful. Respondents do not see why this could not be covered by other management documentation. There is a need for assessing the format and content of the guidelines.

Areas which should be kept as they are

- Minimum requirements for commissioning and takeover in Man 04 are positive and should be retained.
- Environmental management systems for the contractor has a positive effect and should be kept in Man 03.

3 Health and the internal environment (HEA)

3.1 Anticipated changes to the international manual

No planned changes to this chapter have been announced in the international BREEAM manual.

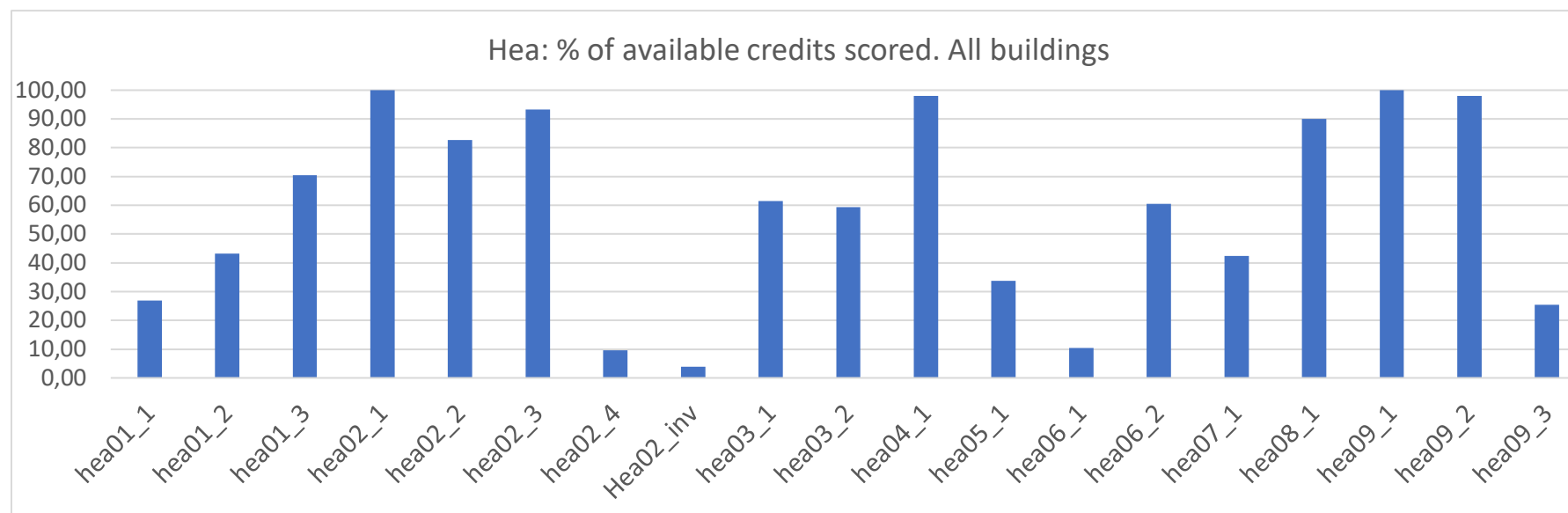
3.2 Trends, analysis and reports

- Good indoor climate in commercial buildings, SINTEF Building Research Building Details Guide 421.505
- Good indoor climate in domestic buildings, SINTEF Building Research Building Details Guide 421.510
- Thermal indoor climate. Conditions, arrangement and measurements, SINTEF Building Research Building Details Guide 421.501
- Indoor climate problems in commercial buildings, SINTEF Building Research Building Details Guide 700.105
- Climate and air quality in the workplace, guidance, order no. 444
- RIF (Norwegian Consulting Engineers' Association) guidelines on daylight in buildings
The guidelines have a definition of “personnel room” which has been harmonised with TEK17 and the Norwegian Working Environment Act. The guidelines also show how daylight can be verified in different types of building and give a clear example of how to document the subject. A reference group was used to create the guidelines. The reference group represented consulting engineers, architects, contractors, sound designers, the Green Building Council and official bodies.
- NS 8175 Acoustic performance in buildings: New version of July 2019
- Construction Process Guidelines BREEAM-NOR parts 1 and 2, Green Building Council.
 - The chapter on when in the process the resource requirements need to be assessed
 - Colour-coded table showing when in the process each item should be executed

3.3 Current manual – chapter statistics

The table below shows a summary of the issues in this chapter where projects often or rarely achieve credits. Following the table is a graph showing the same per credit for each issue. The table also shows the issues which have the most frequent technical questions or clarifications or where assessors most often note a QA deviation. The table additionally shows the most important findings from a survey in which APs and assessors were asked about the individual issues in the manual.

Issue	Analysis of assessors' reports	Technical questions and clarifications and QA			Assessor and AP survey						
Average credits score		Frequent technical questions	Frequent technical queries	Frequent QA NC's	Hard to interpret	Easy to interpret	Hard to achieve	Easy to achieve	Significant documentation costs	Significant execution costs	Low environmental effect
Hea 01	38 %		X				X				
Hea 02	75 %	X	X	X							
Hea 03	98 %										
Hea 04	95 %					X		X			
Hea 05	32 %					X					
Hea 06	32 %	X					X				
Hea 07	42 %										
Hea 08	90 %										
Hea 09	74 %										



3.4 Feedback from the input phase

In spring and autumn 2020, the Norwegian Green Building Council held numerous meetings to gather input for the new manual. There were two main questions:

- What is working well or not so well in the current manual?
- What are your wishes for the new manual?

More than 500 persons took part, and a large number of useful inputs were received, though for practical reasons, not all of them can be mentioned below. The following are some of the most important feedback responses, broken down by issues in the chapter. Half of all questions received, whether as general questions or technical clarification, relate to this chapter

Issue	Input
Hea 01	Visual comfort
General	APs and assessors differ as to whether the issue is easy or difficult.
	Some are asking for examples of how the individual issues can best be documented.

Issue	Input
Criterion 1: Minimum Standards: Non-flicker lighting	Some are asking for more specific details of what constitutes high-frequency LED.
	Is the requirement still relevant? Most projects today use LED, so should the requirement take this into account?
Criterion 2 Daylight	Many feel that daylight is hard to achieve and the issue often goes by the wayside. Some think that daylight is an important characteristic with high marketing value.
	It would be advisable to make the issue simpler, so more respondents can achieve credits for good daylight conditions.
	Daylight may conflict with energy, view out and anti-dazzle requirements in the building. Is there any way of preventing this?
	It is important to include daylight right at the concept level in order to maintain the characteristic in the building. Some think that daylight simulations are introduced far too late in the process.
Criteria 3-5 Glare control control and exterior views	Most feel that the issue is easy to understand and document.
Criteria 6-11 Indoor and outdoor lighting levels and zone division	A few respondents request that the documentation requirements should also cover light measurements in finished buildings.
Hea 02	Indoor air quality
General	APs and assessors differ as to whether the issue is easy or difficult.
	It would be advisable to standardise the documentation form/reports.
	Would it be helpful to provide examples of how the different issues can best be documented?
Criterion 1 Plan for indoor air quality and ventilation	Many feel that there is a big focus on indoor climate in Norway and that this characteristic is directly measurable and easy to market to the building's users/buyers.
	The IAQ plan has the highest role in increasing the costs of documentation. Some also feel that it does not contribute to environmental benefits.
	Most consulting engineers and contractors in heating and ventilation know the requirements, so it is simple to explain what needs to be provided.

Issue	Input
	Separate off the documentation requirements for mineral wool and RTB to Mat 01 and Man 03. Final cleaning is risky when so very late in the project. May lose grading due to requirement for final cleaning. Poor fulfilment cannot be corrected after occupation
Criteria 2-5 Ventilation	Many offices and educational institutions achieve credits here.
	Location of air intakes, may cause higher costs where the shaft area is assessed against the usable area. In a case where all air intakes are on the ceiling, this can be too rigid and marginal compared to what actually brings better air quality to the building.
Criteria 6-9 VOC	The criteria are a minimum requirement for Very Good and Excellent, which explains why so many achieve credits here.
	The issue is important for users/buyers.
	Many feel that producers have the necessary documentation for scoring credits here.
	Some feel that documentation is very costly, while other think that digital media, such as ProductXchange, make this very simple.
Criteria 10-15 Potential for natural ventilation	Most APs and assessors feel that the reason why so few achieve credits here is a lack of knowledge. But it is interesting to see alternative low-technology solutions.
	It would be desirable to see examples of successful projects using natural ventilation.
Criteria 16-18 Containment equipment and pollution areas for laboratories	Not many projects have laboratories, enabling them to achieve a credit here.
Criteria 19-22 Buildings with laboratories at safety levels 2 and 3	Not many projects have laboratories, enabling them to achieve a credit here.
Criteria for exemplary level credits	Certain technical inputs have been received for measurement times for degassing individual chemicals.
Hea 03	Thermal comfort
General	Not many projects seem to use Hea 03 as a lever for achieving a more user-friendly solution.
	Would prefer compliance notes as guidance on the room types which require more advanced calculations. A fully dynamic analysis of a hotel room and a glazed atrium require different advice.
Criteria 5-7 Thermal environment – thermal	A few feel that temperature strategies can be set up without user involvement.

Issue	Input
modelling is used as a basis for operating strategy	
Hea 04	Prevention of legionnaires disease
Criteria 1-2 Limiting the risk of legionnaires disease	Comments noting that this is currently compulsory.
Hea 05	Acoustic performance
General	Very few achieve credits here, despite APs and assessors feeling this is an easily interpreted issue.
Criterion 1 pre-requisite: Appointment of expert acoustics technician	Some comment that it is unclear at what point the acoustic advice should be implemented.
Criterion 1 Acoustic calculations	A revised version of the NS 8175 standard for sound was published in July 2019.
Criterion 2 Noise measurement	A few commented that this can be very expensive. Could it be a requirement to test the first areas as they are completed? Risk of missing out on credits because there are limited opportunities for improvement prior to occupation.
Hea 06	Safe access
General	Inputs from APs and assessors that the documentation requirement entails higher costs. Hard to see the environmental benefit of the measures.
	Excessive number of details in the issue. If just one criterion is omitted, the whole credit is lost. Crossroads, goods deliveries and cycle paths are often in conflict.
	The requirement is too strict and difficult to implement in centrally located built up sites.
	Some feel that the issue is introduced far too late in the process and ought to be linked to an earlier phase.
Criterion 1 Pedestrian and cyclist safety	Separation between pedestrians and cyclists, e.g. in underground car parks, is a complex matter. Requires project redesign. Takes up a lot of space. Goods delivery is often a challenge.
Criteria 12-14 Inclusive and accessible design	Universal design guidelines from the Norwegian National Office of Building Technology and Administration can be very lengthy.
Hea 07	Natural hazards
Criteria 1-2	Nonsense to give credits for earthquakes but not for wind storms/hurricanes in many parts of Norway.

Issue	Input
Natural hazards	
Hea 09	Humidity protection
Criteria 1 and 2 Humidity protection control plan	Assessment criteria 1 and 2 need restructuring. Stage references should be updated/tightened up.

3.5 Other countries' BREEAM manuals

BREEAM is a worldwide certification scheme. The following is a comparison of the international BREEAM manual, the British version and the Dutch version. The latter two are of later date and may therefore contain inputs to BREEAM-NOR 2021.

Issue	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
Hea 01	Visual comfort		
Criterion 2 Daylight		Innovation credit for daylight if better daylight conditions are achieved.	
Criteria 3-5 Glare control control and exterior views		Glare control and view out have been split in two.	Glare control and view out have been split into two.
Criteria 6-11 Indoor and outdoor lighting levels and zone division		Innovation credit for better user control of lighting.	Zoning and lighting levels have been split into two. Requirements for lighting levels are a minimum requirement from Pass upwards.
Hea 02	Indoor air quality		
Criterion 1 Plan for indoor air quality and ventilation		Pre-requisite, no credits.	Pre-requisite, no credits. Minimum requirement from Pass upwards.
Criteria 16-18		Omitted as separate requirement.	Omitted as separate requirement.

Issue	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
Containment equipment and pollution areas for laboratories			
Criteria 19-22 Buildings with laboratories at safety levels 2 and 3		Omitted as separate requirement.	Omitted as separate requirement.
Criteria for exemplary level credits Measurement of indoor air quality.	Regular credits Not innovation.	Regular credits Not innovation.	Regular credits Not innovation.
Hea 03	Thermal comfort		
Criteria 1-4 Thermal environment – thermal modelling in the project design	Credit for design for future thermal comfort. The project must show that by using passive design solutions the building can be adapted into: - A naturally ventilated building: adaptation to climate changes for the period: 50 years after completion and emissions scenario from IPCC: medium (A1B) - Mechanically ventilated and hybrid ventilated building: adaptation to climate changes for the period: 15 years after completion and emissions scenario from IPCC: medium (A1B)	Credit for design for future thermal comfort. The project must show that that by using passive design solutions the building can be adapted into: - Naturally ventilated building: in the 2050's and IPCC emissions scenario: medium (A1B) - Mechanically ventilated and hybrid ventilated building: in the 2050's and IPCC emissions scenario: high (A1F1)	This is designated as HEA04. Minimum requirement from Very Good upwards. Additional: credits for design for future thermal comfort (adaptation to climate changes described in Dutch standard NEN 5060:2018)
Hea 04	Prevention of legionnaires disease		
Criteria 1-2	Minimum requirements at Pass		

Issue	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
Limiting the risk of legionnaires disease			
Hea 06	Safe access		
Criteria 12-14 Inclusive and accessible design	Minimum requirement for Outstanding.		
Hea 07	Natural hazards		
			Removed from manual.
Hea 08	Private areas		
		This has been moved to Hea 06 and applies to all types of building.	Removed from manual.
Additional issue: Hea 10			Biophilic Design
			Including nature and natural aspects in the building and its environs. Using natural elements, natural materials, retreat facilities etc.
Additional topic: Hea 11		Security	Security
		Security from theft and vandalism.	Security from theft and vandalism.

3.6 Conclusion

Most important findings and necessary changes

- Daylight assessment is important, but hard to achieve.
- The plan for indoor air quality is well-known but it should be noted that the documentation is time-consuming.
- Emissions requirements are well integrated but the documentation work is time-consuming.

- Positive that credits for natural ventilation are included, but uncertain whether this can be harmonised with TEK (Norwegian regulations on technical requirements for building works).
- Hea 06 Safe access has many requirements and seems very complex to many.

Areas which should be kept as they are

- Exterior view requirements are clear.
- Emissions criteria are important and should be kept.

4 Energy (ENE)

4.1 Anticipated changes to the international manual

The following changes are planned for the new international BREEAM manual:

Issue ID and name	Main contents
Ene 01 Energy efficiency	Tightening the criteria for achieving credits. Making it more difficult to achieve a full score. BRE sees a gap between the estimated energy consumption and the actual energy consumption in the operating phase. It is therefore considered that energy estimates of actual energy consumption should be requested, for relevant operating periods, occupancies and technical equipment . Alternatively, required reporting of measured energy consumption once the building is in operation.
Ene 02 Energy monitoring	No major changes are planned.
Ene 03 External lighting	BRE is considering changing the minimum requirements for this credit, as it is viewed too easy to achieve.
Ene 05 – Ene 08 Energy requirements for equipment	BRE is considering sharpening and combining several of these issues. The products on the market have improved so much that it is too easy to achieve credits. Relatively speaking, too many credits are awarded for energy-efficient equipment, compared with those achievable under, e.g. Ene 01. This will be adjusted.
Ene 09 Drying space	BRE considers removing this issue because they see no positive effect compared to many other measures for achieving lower energy demand in the operating phase.

4.2 Trends, analysis and reports

- FutureBuilt Plus House definition
A criteria set in which a plus house is defined as the annual energy consumption from the operation of the building which needs to be equalled or exceeded by internal production of renewable energy. To be deemed a plus house, it must produce surplus energy of 2 kWh/m² usable floor space per year.
- FutureBuilt nZeb definition
Description of calculation method and determination of limit values for weighted supplied energy for the different building types.
- FutureBuilt's criteria for low emissions buildings

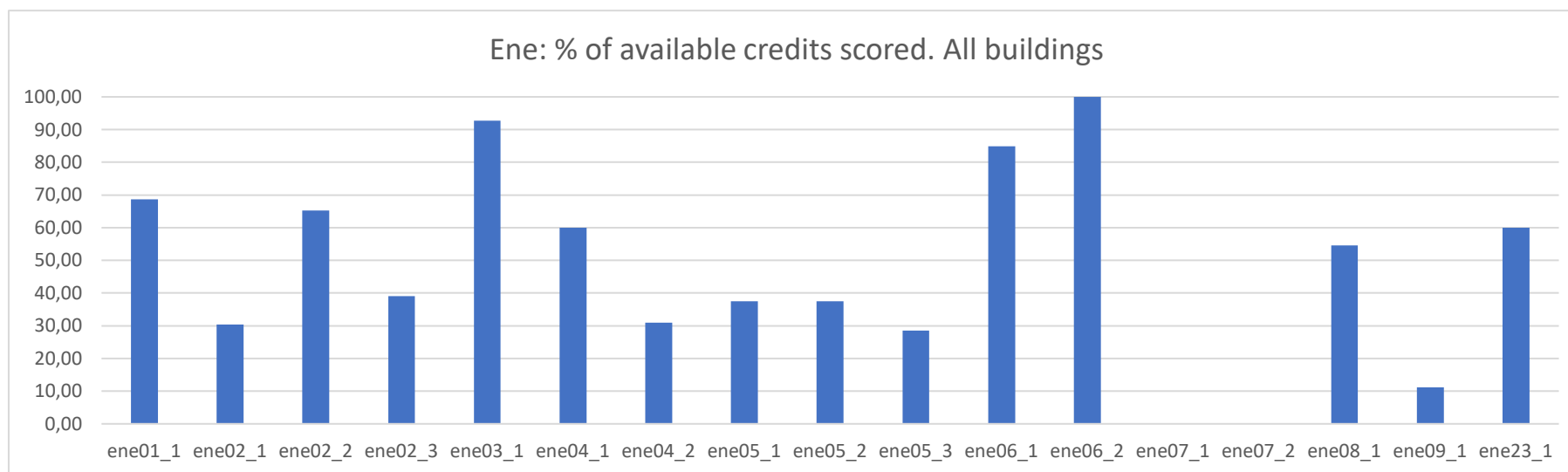
A criteria set describing the requirements for footprint calculations including greenhouse gas emissions of the different phases of the building's service life in order to achieve zero emissions buildings. This indicates an absolute figure for the emissions budget which new projects must achieve or be less than. This applies to materials and energy

- Enova's criteria for existing buildings
Description of requirements for energy monitoring systems, sub-metering, actions and method for calculating heating requirements.
- Enova's criteria for new build
Description of requirements for the building shell, technical systems and energy supply for achieving Enova support.
- NS 3031:2020
The updated standard describes the method for calculating the net energy requirement, gross energy requirements and supplied and exported energy. The standard also describes the energy calculation method for multi-function buildings and requirements for assessing the various energy supply solutions. The standard also describes the method for calculating the weighted supplied energy by including an estimate of primary energy, CO₂-equivalent emissions and energy costs for the various energy sources for both supplied and exported energy.
- Renewables Directive COM/2016/0767 final/2 - 2016/0382 (COD)
- EU taxonomy of sustainable finance
Describes the requirements for the building's energy requirements < 20 % of Nearly Zero Energy Buildings (NZEB) (NZEB has not yet been defined at national level in Norway). Both energy efficiency and renewable energy production are included in the definition.
- Paris Proof buildings – memorandum from the Norwegian Green Building Council
Requirements for energy class A and energy supply with low greenhouse gas emissions.
- New Technical Regulation 2021 – a requirement for nearly zero energy buildings is on the way
- A criteria set for assessment and highlighting of greenhouse gas emissions and climate adaptation in the Oslo planning process
 - Establishing interactivity solutions with nearly buildings and plant
 - Plan for efficient use of surplus energy/waste heat
 - Producing electricity, heat or cooling locally from renewable sources
 - Description of how renewable energy is used throughout all project phases, whether in production of materials, in the building phase or in operation.
 - Assessment of whether the selected energy contributes to higher flexibility in the energy system.
 - Description of whether the use of combined solutions has been considered, e.g. green roofs combined with solar cells.
 - Connection to the district heating grid if the plan area is within the concession area.

4.3 Current manual – chapter statistics

The table below shows a summary of the issues in this chapter where projects often or rarely achieve credits. Following the table is a graph showing the same per credit for each issue. The table also shows the issues which have the most frequent technical questions or clarifications or where assessors most often note a QA deviation. The table additionally shows the most important findings from a survey in which APs and assessors were asked about the individual issues in the manual.

Issue	Analysis of assessors' reports	Technical questions and clarifications and QA			Assessor and AP survey						
	Average credits score	Frequent technical questions	Frequent technical queries	Frequent QA NC's	Hard to interpret	Easy to interpret	Hard to achieve	Easy to achieve	Significant documentation costs	Significant execution costs	Low environmental effect
Ene 01	69 %					X					
Ene 02a	56 %		X	X							
Ene 02b	0 %										
Ene 03	93 %			X		X					
Ene 04	45 %										
Ene 05	33 %										
Ene 06	85 %										
Ene 07	0 %										
Ene 08	54 %										
Ene 09	11 %										
Ene 23	60 %					X					



4.4 Feedback from the input phase

In spring and autumn 2020, the Norwegian Green Building Council held numerous meetings to gather input for the new manual. There were two main questions:

- What is working well or not so well in the current manual?
- What are your wishes for the new manual?

More than 500 persons took part, and a large number of useful inputs were received, though for practical reasons, not all of them can be mentioned below. The following are some of the most important feedback responses, broken down by issues in the chapter. Half of all questions received, whether as general questions or technical clarification, relate to HEA.

Issue	Input
Ene 01	Energy efficiency
Criteria 1-4 Determination of building's energy output	This is an easily understood issue with high marketing value.
	Maybe energy label C is too low as a reference level? Others felt the issue should give fewer credits as there is a

Issue	Input
	big focus on energy efficiency nowadays. And others felt that the number of credits should be linked to certification levels as minimum requirements from lower-level certifications.
	Requests have been made for definitions of plus houses, zero energy buildings and zero emissions buildings, all of which justify credits under Ene 01.
	Several respondents commented that there should be a focus on peak shaving and smart control in Ene 01.
	A few felt that stricter requirements should be set for documentation of input data in the calculations, and that the data needed to be adjusted to the individual building, i.e. using real data.
	Some APs and assessors feel that net energy requirement, supplied energy requirement and greenhouse gas emissions should be linked together when evaluating energy under Ene 01.
	Some felt that estimated energy needs to be linked to measured energy.
	A few wanted a greater focus on passive design measures as part of Ene 01.
Ene 02a	Energy monitoring (commercial buildings)
	Important requirement which must be retained.
Criteria 1-3 Energy measurement	A clearer statement that criteria 1-3 are a minimum requirement would be desirable.
	Should consider whether Enova's minimum requirements for energy management systems (BMS) can be used as a text in the manual.
Criteria 4-7 Energy measurement and monitoring 12 months later	The issue is said to have high value compared with current regulations.
Criterion 8 Energy measurement for tenanted areas.	Can lead to an inconveniently high number of meters.
	The third credit has value, depending on whether there are several tenants or not. Has no value if it is the same tenant on all floors and an identical pattern of usage. Has great value if individual settlement per storey is desired. Especially in the case of users with different operating times and types of business. Offices can be rented out to many different types of business.
Ene 02b	Energy monitoring (residential)
Criteria 1-2 Energy monitoring in domestic	Several APs and assessors report that it is hard to find energy meters which correspond to the description in Ene 02b. BREEAM's requirement for submeters does not match what is available on the market. Can the intention

Issue	Input
buildings	behind the criterion be documented in a different way?
	Some felt that metering each unit in a housing association is of little value and that the measurement of thermal energy is relatively expensive.
	No housing projects have achieved credits here.
Ene 03	External lighting
Criteria 1-2 Type and control system of outdoor lighting	Easy to set requirements for this to manufacturers. Perhaps the requirement can be tightened up slightly, as most light fittings are LED and not halogen.
	Easy for commercial projects, costly and difficult for balcony lighting in residential, especially if Pol 04 is also to be met.
Ene 04	Energy supply with low greenhouse gas emissions
Criteria 1-3 Preliminary study for different energy supply scenarios	APs and assessors feel it is difficult to interpret how district heating is to be documented here. It is also unclear how to deal with situation in which connection to district heating is compulsory.
	BREEAM's changes to waste incineration plants are there to make it worthwhile to reduce CO2 emissions
	Ene 04 would create more value if there were a reward for installing internally produced energy.
	Minimum requirements at Excellent may be omitted, as the use of renewable energy sources is imposed by law.
Criteria 4-5 Preliminary study for different energy supply scenarios and their greenhouse gas calculations	Check greenhouse gas factors so they harmonise with the renewables directive, etc.
	Second generation biofuels, under certain circumstances, are counted under biofuels and have emissions factors which are lower than electrical energy. This is contradicted by the biofuels hierarchy in the Norwegian Environment Agency, which ranks electrical energy above biofuels.
Ene 05	Energy-efficient cold storage
Criteria 1-5 Assessment, installation and commissioning of energy-efficient cold storage.	APs and assessors report that the issue is hard to interpret. Many requirements to be fulfilled and the area seems technically complex.
Ene 06	Energy efficient transportation systems

Issue	Input
Criterion 1 Analysis of transport needs	Lifts analysis: located too late - requirements should be set for the phase in which it must be done.
	The issue should be have greater connection with stairways in order to have a higher value. Reward designs which integrate good stairways for reducing the use of lifts, while also providing health benefits and social zones. In addition to energy-efficient lifts.
	The issue needs updating with modern solutions/technology.
Criteria 2-4 Requirements for energy-efficient lifts	It is more usual to use UPS as a power reserve for lifts than as backup in case of fire. This is probably hard to reconcile with a regenerative unit.
Ene 08	Energy-efficient equipment
Criterion 1 Energy-efficient equipment	Could perhaps better be structured like Tra 03a, in which a given number of alternatives must be selected from the list.
	The requirements need to be updated to reflect the changes to the labelling schemes.
	Requirements must be laid down which refer to the standards/certifications usual in Norway. Omit the British schemes
Ene 09	Drying space
Criteria 1-3 Drying space in residential buildings	APs and assessors commented that the issue has high value for domestic buildings, but that the ordering entities are rarely interested.
Ene 23	Energy performance of building construction
General	Thermography must be planned into the building project.
	May mean that old buildings subject to major refurbishment cannot achieve the Outstanding grade due to the fact that this is a minimum requirement.

4.5 Other countries' BREEAM manuals

BREEAM is a worldwide certification scheme. The following is a comparison of the international BREEAM manual, the British version and the Dutch version. The latter two are of later date and may therefore contain inputs to BREEAM-NOR 2021.

Topic	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
Ene 01 Energy efficiency			
	Energy requirements are linked to a reduction in net energy demand, supplied energy and greenhouse gas emissions measured against a fixed reference.	Quality assurance and risk analysis of assumed net energy demand and the demand for supplied energy achieved by involving the relevant members of the project design group. Analysis must take account of climate change and be based on actual data.	Minimum requirement from Very Good: must show the reduction in net energy demand and supplied energy separately. Pre-requisite for analysis and implementation of energy supply systems with low greenhouse gas emissions.
Ene 02 Energy monitoring			
			Ene 02b for domestic buildings has been completely removed. Ene 02a criteria 1–3 are minimum requirements for Very Good.
Ene 04 Energy supply with low greenhouse gas emissions			
General	Possible to achieve credit for passive design. Must achieve credit for Thermal comfort in Hea 03 before analysis of possible measures. Requirement for 5 % reduction of demand for supplied energy or greenhouse gas emissions.		Same as BREEAM International NC 2016. Specification of minimum requirements for passive design analysis. Additional credit for free cooling.
Criteria 1-3 Preliminary study for different energy supply scenarios			Reduction of demand for supplied energy cannot be greater than a fixed cost/m ²
Ene 05 Energy-efficient cold storage			
General			Credit for energy recycling from cold stores.

Topic	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
Ene 08 Energy-efficient equipment			
General			Credit for reuse of old equipment if this is a more energy-efficient alternative in the service life than specifying new equipment.
Ene 09 Drying space			
			Removed

4.6 Conclusion

Most important findings and necessary changes

- Many projects achieve many credits on Ene 01. Need for tightening up the requirements and better harmonisation with modern energy labels. Consider minimum requirements at Very Good level.
- Consider whether to award credits for avoiding effect peaks and plus house.
- Consider viewing energy consumption and greenhouse gas emissions as linked, as is done in the British and Dutch manuals.
- Consider whether energy calculations should be more based on in-use data and be more tailored to the actual building.
- Feedback that sometimes Ene 02 leads to an excessively complicated meter structure. Domestic buildings report that it is difficult to find suitable meters. No domestic building project has achieved a credit on Ene 02.
- Ene 05-08 concerns building equipment and will be amended in the new manual. Need to be updated with new technology and new standards.

Areas which should be kept as they are

- The connection with the energy labelling scheme in Ene 01 is logical and is interpreted well.
- Ene 03 External lighting is easy to understand.

5 Transport (TRA)

5.1 Anticipated changes to the international manual

No planned changes to this chapter have been announced in the international BREEAM manual.

5.2 Trends, analysis and reports

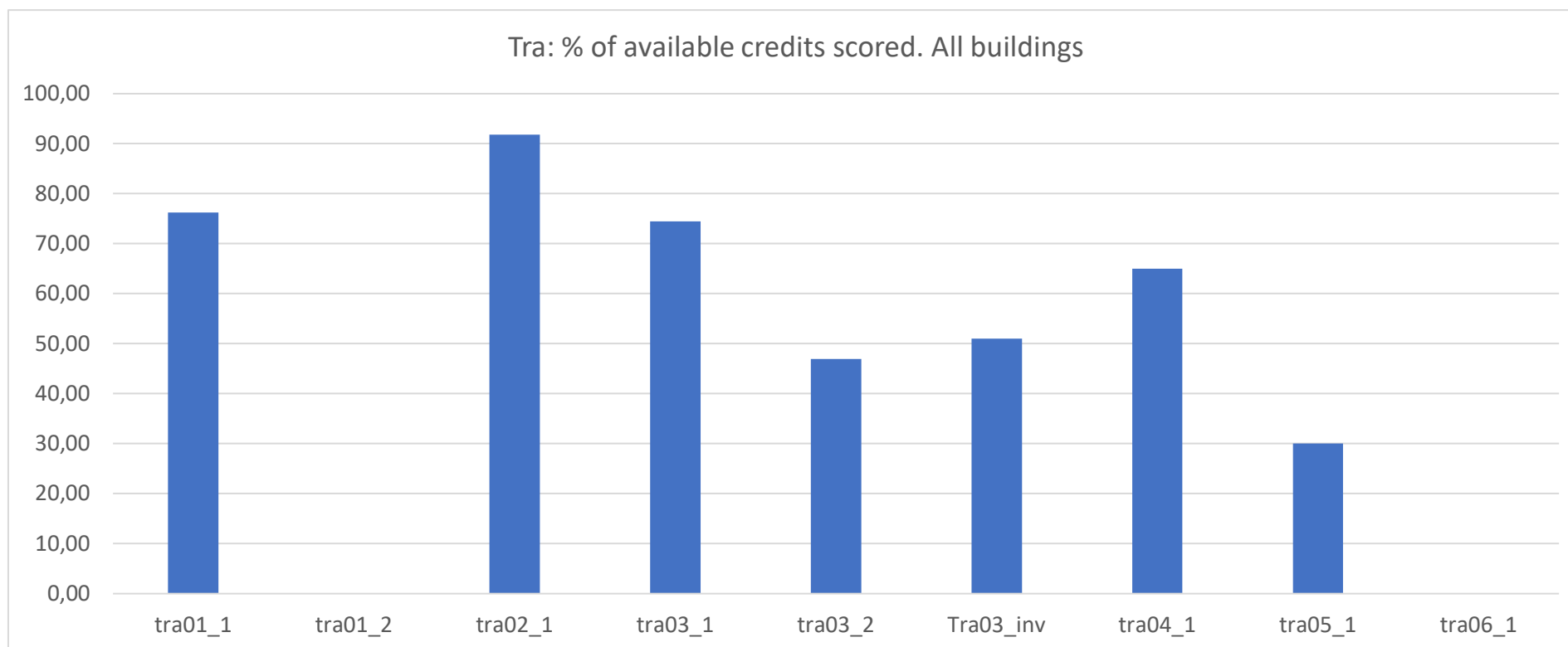
- EU taxonomy of sustainable finance
 - Describes the requirements for the building's energy requirements < 20 % of Nearly Zero Energy Buildings (NZEB) (NZEB has not yet been defined at national level in Norway) – and both energy efficiency and renewable energy production are included in the definition.
 - Must be constructed with plant machinery which satisfies the Non-Road Mobile Machinery (NRMM) Directive
- Paris-Proof buildings. Memorandum from the Green Building Council describing the issues in BREEAM-NOR which contribute to achieving the Paris Agreement.
 - Travel plan and quantification of greenhouse gas emissions in transport in operation
- A criteria set for assessment and highlighting of greenhouse gas emissions and climate adaptation in the Oslo planning process
 - Fossil-free building site with description of a number of plant machinery items which are fossil-free and the proportion which are emissions-free
 - Description of the fossil-free and emissions-free alternatives to be used in the construction phase
 - Description of the proportion of fossil-free or emissions free transport to and from the construction site
 - Description of measures for reducing transport to and from the construction site
 - Green mobility (collective transport, cycling or on foot), adapted to future climate changes
 - Limiting parking for cars and establishing parking for low carbon vehicles
- FutureBuilt “Guidelines for green mobility in urban areas”
- FutureBuilt “Mobility Guidelines”
- FutureBuilt “Guidelines for cycle-friendly construction”
- Norwegian Institute of Transport Economics (TØI): “Sustainable urban logistics: Guidelines for municipalities”
- City of Oslo “Guidelines for public cycle parking”
- Multiconsult “Experiential survey of requirements for fossil-free building sites”
- DNV GL “Guidelines for design of fossil-free and emission-free solutions on the building site”

- Norwegian Workplace Regulations
- Digitalisation of construction process
 - How should the process be adapted in cases where the project uses a BIM tool?

5.3 Current manual – chapter statistics

The table below shows a summary of the issues in this chapter where projects often or rarely achieve credits. Following the table is a graph showing the same per credit for each issue. The table also shows the issues which have the most frequent technical questions or clarifications or where assessors most often note a QA deviation. The table additionally shows the most important findings from a survey in which APs and assessors were asked about the individual issues in the manual.

Issue	Analysis of assessors' reports	Technical questions and clarifications and QA			Assessor and AP survey						
	Average credits achieve	Frequent technical questions	Frequent technical queries	Frequent QA NC's	Hard to interpret	Easy to interpret	Hard to achieve	Easy to achieve	Significant documentation costs	Significant execution costs	Low environmental effect
Tra 01	76 %			X		X					
Tra 02	92 %					X					
Tra 03a	75 %	X	X								
Tra 03b	47 %										
Tra 04	65 %					X					
Tra 05	30 %										
Tra 06	0 %										



5.4 Feedback from the input phase

In spring and autumn 2020, the Norwegian Green Building Council held numerous meetings to gather input for the new manual. There were two main questions:

- What is working well or not so well in the current manual?
- What are your wishes for the new manual?

More than 500 persons took part, and a large number of useful inputs were received, though for practical reasons, not all of them can be mentioned below. The following are some of the most important feedback responses, broken down by issues in the chapter.

Issue	Input
General	
	Need for better definition of building user and a clear definition of the different types of school.
Tra 01	Public transport provision
Criterion 1 Public transport index	Good idea to reward good localisation. That is important.
Tra 02	Proximity to amenities
	Some feel that the issue is no longer relevant and contributes little of value.
Tra 03a (commerce)	Alternative modes of transport
General	APs and assessors report that many projects are keen to master this, whether or not they achieve BREEAM credits.
	The issue provides benefits for users throughout the service life of the building.
	In zoning plans, there is often a requirement for a certain number of cycle parking spaces - in which case they are "cheap". For projects without this requirement, this is extremely important. Is a differentiation possible?
	The most common method is to take these two alternatives: Alt 3 Cycle parking and Alt 5, electric cars, electric bikes. Surprising if people do not achieve these credits.
	In residential, the choice is often for cycle parking and 30% electric car spaces. If this had not been a requirement it would perhaps never been built.
	Possible that the rule that high achieves on the collective transport index allows fewer cycle spaces can make things a bit too easy.
	It should be possible to achieve a higher ambition level than the project suggests today. And electric cars will soon be even more common.
	BREEAM requirements for showers, lockers, drying facilities for wet clothing and cycle washdown facilities are great and give extra value, unlike legislative requirements.
	Some developers do not want washdown facilities, due to problems with operation and maintenance.
	Some feel that providing charging stations for electric cars may seem illogical compared to facilities for public transport?
	10% cycle parking for electric bikes is a bit strange. They are not used in practice. Most people take their batteries with them.
	Location gives good achieve in Tra 1 and Tra 2. Possibility for reducing cycle parking in Tra 03 due to good location is perhaps a bad idea?

Issue	Input
Tra 03b (residential)	Alternative modes of transport
General	10% cycle parking for electric bikes is a bit strange. They are not used in practice. Most people take their batteries with them up to their flats.
	Cycle parking for electric bikes is a bit strange, as most people take their batteries with them up to the building.
	Most commonly, projects achieve most credits on cycle parking and electric cars. Perhaps the ambition level needs increasing?
Tra 04	Car parking capacity
General	Reduce the focus on counting parking spaces and increasing the focus on smart sharing solutions etc.
	I would have liked this issue to reward people who completely omitted parking. The credit requirement are not ambitious enough.
	The requirements are not strict enough for city projects in which zoning plans are often stricter than the requirement.
Tra 05	Travel plan
General	Where travel behaviour surveys are available, plans like this are a really good idea. But in remoter areas where no such surveys are available, achieving the credits can be an awful lot of work.
	The travel plan should be connected to the measures in Section 1. Intention of developing a strategy which can form a good basis for mobility with the minimum environmental impact. Sometimes feels like a desktop exercise, with nothing concrete to show for it.
	In really big projects, it will give slightly more benefit. For example, with regard to areas and larger buildings such as the Oslo Government Quarter and the UiO Life Sciences Centre. Here, the outdoor area and location of exits for making good connections to transport systems are important.
Tra 06	Home office
General	Home office in residential: Very useful credits (especially following Corona), but the issues need adapting better. As it is, they do not work exactly as they should.
	The requirement for 1.8 m and lighting and ventilation, etc. are seen as difficult. Perhaps not really necessary.

5.5 Other countries' BREEAM manuals

BREEAM is a worldwide certification scheme. The following is a comparison of the international BREEAM manual, the British version and the Dutch version. The latter two are of later date and may therefore contain inputs to BREEAM-NOR 2021.

Topic	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
Tra 01	Public transport index		
		Moved to Tra 03 and part of the evaluation in the travel plan.	
Tra 02	Proximity to amenities		
		Moved to Tra 05 and part of the evaluation in the travel plan.	
Tra 03 a	Alternative modes of transport (commerce)		
		Travel plan (or parts of it) is a prior requirement for winning credits here. Tra 01 has been moved here.	The table has been simplified and has a greater emphasis on car sharing.
Tra 03 b	Alternative modes of transport (residential)		
		Mobility plan (parts of it) is a prerequisite for winning credits here. Tra 01 has been moved here.	
Tra 04	Car parking capacity		
		None	
Tra 05	Travel plan		
		Much extended with Tra 02	
Tra 06	Home office		
		None	

5.6 Conclusion

Most important findings and necessary changes

- Tra 02 Proximity to amenities should be updated.
- Tra 03 Alternative modes of transport give the building added value, but the requirements should be tighter.
- Tra 04: Consider moving focus from car parking to smart car sharing solutions.
- The benefit of the travel plan in Tra 05 is regarded to be low, even though planning of transport solutions is regarded as important.
- Tra 06 Home office should be revised to appear more relevant.

Areas which should be kept as they are

- None identified

6 Water (WAT)

6.1 Anticipated changes to the international manual

No major changes to this chapter have been planned in the international manual

6.2 Trends, analysis and reports

EU taxonomy of sustainable finance:

Minimum requirements for water-efficient installations

6.3 Current manual – chapter statistics

The table below shows a summary of the issues in this chapter where projects often or rarely achieve credits. Following the table is a graph showing the same per credit for each issue. The table also shows the issues which have the most frequent technical questions or clarifications or where assessors most often note a QA deviation. The table additionally shows the most important findings from a survey in which APs and assessors were asked about the individual issues in the manual.

Issue	Analysis of assessors' reports	Technical questions and clarifications and QA			Assessor and AP survey						
		Frequent technical questions	Frequent technical queries	Frequent QA NC's	Hard to interpret	Easy to interpret	Hard to achieve	Easy to achieve	Significant documentation costs	Significant execution costs	Low environmental effect
Wat 01	54 %	X									
Wat 02	88 %			X		X					
Wat 03	41 %					X					
Wat 04	95 %					X					

6.4 Feedback from the input phase

In spring and autumn 2020, the Norwegian Green Building Council held numerous meetings to gather input for the new manual. There were two main questions:

- What is working well or not so well in the current manual?
- What are your wishes for the new manual?

More than 500 persons took part, and a large number of useful inputs were received, though for practical reasons, not all of them can be mentioned below. The following are some of the most important feedback responses, broken down by chapter issues.

Issue	Input
Wat 01 Water consumption	
	Residential projects achieve few credits, unlike commercial buildings which achieve many. Could be due to tighter budgets in residential projects. Could this be experienced as lower quality for domestic building buyers? Harder to sell as better comfort.
	Commercial buildings: some feedback that there is too little water, but this was more often the case previously. People are more willing to accept that we have to save on water.
Criterion 4 Grey water plant	Grey water plant. From experience, this is a high cost driver. No-one has any experience of implementing a grey water plant. The Mjøstårnet Tower has a grey water recycler. This is effective but it is uncertain whether it covers the investment costs.
	Experience with vacuum toilets in a project. Saves a lot of water. Experience with this from Haugesund. Feedback was good, as was experience with use.
	Purified drinking water must not be used for flushing.
	Water-free urinals should be rewarded in BREEAM.
	Water in Norway: not an important issue.
	Hard to achieve more than 1 or 2 credits.
	The innovation credit is expensive to implement.
Wat 02 Water monitoring	
	Questionnaire to APs and assessors: 32% answered that the project sees no environmental benefit from the issue.

Issue	Input
	Hard to establish suitable sub-metering.
Wat 03 Leak detection and prevention	
	Detection can be expensive if there are many WC cores.
	The reference point has been moved to water meters for the water supplier. In most cases this meter is in the building. This means that leaks in the pipe between the WC and the building are not detected.
Wat 04 Water efficient equipment	
	The credits depend on location and geography.
	LARK good at selecting robust plants which do not need artificial watering.
	Hard to interpret cases falling between no carwash and a commercial carwash. Do the requirements apply to a manual washing site for company cars in the same way as for a carwash installation which makes its money from selling car washing? This is rather unclear.

6.5 Other countries' BREEAM manuals

BREEAM is a worldwide certification scheme. The following is a comparison of the international BREEAM manual, the British version and the Dutch version. The latter two are of later date and may therefore contain inputs to BREEAM-NOR 2021.

Topic	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
Wat 01 Water consumption			
		Table 8.3 and summary of sanitary equipment and distribution of credits regarding water consumption: slighter stricter levels for scoring credits.	
		Method for measuring water consumption in automatic taps	
Wat 04 Water saving equipment			
		Completely different from BREEAM-NOR. Survey of	

Topic	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
		water-intensive equipment beyond what is indicated in Wat 01 and identifying measures for reducing water consumption. Usage examples: swimming pools, carwashes, industrial processes, air humidification plants, watering equipment.	

6.6 Conclusion

Most important findings and necessary changes

- Arguing for water savings is a challenge, especially in residential projects.
- The British manual has tightened up the credit requirements in Wat 01. Must achieve a rather lower volume to achieve credits. Could consider tightening up BREEAM-NOR.
- Grey water and rainwater plant is still unknown technology and not used in BREEAM projects.
- In the British manual, the aim of Wat 04 is to reduce water consumption for non-sanitary use. Not just irrigation and carwashes. This makes the issue more relevant.

Areas which should be kept as they are

- None identified

7 Resources (formerly Mat and Wst)

This is a summary of the inputs and analysis to the new chapter “Resources”. This includes the chapters on Materials and Waste. Circular construction is part of this summary.

7.1 Anticipated changes to the international manual

This chapter will combine materials and waste, forming a new chapter named Resources. The new potential issues are shown below. Wst 02 will most probably be removed from the manual.

Issue ID and name	Main contents
Res 01 Life cycle impacts	<ul style="list-style-type: none"> • Corresponds to Mat 01 in the current BREEAM International. • Environmental impact of building materials. LCA analysis. I.e., criteria 7-10 in Mat 01 in the current BREEAM-NOR manual. • LCA must be performed at the project brief and be updated in the project design phases. • More detailed process requirements by making the LCA analysis. • More credits available than previously.
Res 02 Environmental impacts from construction products – EPD	<ul style="list-style-type: none"> • Corresponds to criterion 2 in Mat 01 in the current BREEAM-NOR, but with different methodology. • 1 credit if the project achieves a total score of 20 under the following method: <ul style="list-style-type: none"> ○ 0.5-1.5 score per EPD depending on whether the EPD is generic or product-specific. ○ Maximum score of 4 for a product category. ○ Scores are totalled and give 1 credit if total score is over 20. • Follows the methodology of BREEAM UK, Mat 02.
Res 03 Responsible sourcing of construction products	<ul style="list-style-type: none"> • Will follow the methodology of BREEAM UK Mat 03. • 1. Make a purchasing plan to enable sustainable purchases according to a method. • 2. Measure sustainable purchases using the Mat 03 calculator. This must be made easier to use. <ul style="list-style-type: none"> ○ Two possible routes for each product: <ul style="list-style-type: none"> ▪ Route 1: Assessing products without quantity calculations. Does not give as many credits

Issue ID and name	Main contents
	<ul style="list-style-type: none"> as route 2. <ul style="list-style-type: none"> Route 2: Assessing products with quantity calculations. <ul style="list-style-type: none"> May be assessed on the basis of a smaller scope of supply. For example, products in the climate shell or products in the climate shell + fit-out. The greater the scope of the assessment, the greater the number of credits. Otherwise the same as the current Mat 03, where credits are achieved if suppliers can document certification (e.g. ISO 14001). More credits if you can document back up the supplier chain (supplier's supplier). Expands assessment of the supplier's performance to include several other areas, e.g. circularity. Taken from RES 04 in BREEAM In-Use.
Res 04 Construction resources management	<ul style="list-style-type: none"> Follows the methodology of Wst 01 in BREEAM UK 2018. The content is largely identical to Wst 01 in BREEAM-NOR. Feasibility study prior to demolition gives a separate credit. Done before the sketch project is complete.
Res 05 Operational resources management	<ul style="list-style-type: none"> Corresponds to Wst 03 in current BREEAM-NOR manual. Will include issues from BREEAM In-Use: <ul style="list-style-type: none"> From BIU Res 02: A suitable location for handling building waste is available for the tenant's fit-out work and ensures optimum sorting, storage and collection of building waste. From BIU Res 02: A storage area for reusable building materials is available on the property or locally.
Res 06 Designing for circularity	<p>Four parts:</p> <p>Resilient construction:</p> <ul style="list-style-type: none"> A continuation of the current Mat 05 in BREEAM-NOR Specific criteria for preventing water damage and criteria for entrance areas <p>Materials efficiency:</p> <ul style="list-style-type: none"> Same methodology as in Mat 06 in UK 2018 In steps 1 and 2: set goals and identify potential effectivisation of use of materials in the project Must cover all project phases and be followed up. Results are to be reported Detailed methodology for all phases, with targets, assigned responsibilities, actions and proof requirements Methodology based on BS 8895 Designing for material efficiency in building projects <p>Choice of floor coverings and ceilings (speculative finishes)</p>

Issue ID and name	Main contents
	<ul style="list-style-type: none"> • A continuation of Wst 04 • Design for disassembly and adaptability • Same methodology as Wst 06 in BREEAM UK 2018 • In step 2: determine the potential for design for disassembly and adaptability in various concepts. Identify actions. • In steps 3-4: determine how the proposals have been implemented and explain any changes. • Make a guide for adaptation and disassembly of the building. • Will include issues from BREEAM In-Use: <ul style="list-style-type: none"> ○ From BIU Res 03: establish a resource database.

7.2 Trends, analysis and reports

- National strategy for the circular economy from the Norwegian Climate Ministry. Forthcoming Autumn 2020.
- New Technical Regulations. Uncertain when these will appear, but the Norwegian Ministry of Local Government and Modernisation has asked the Norwegian Building Authority to produce a definition of the nearly zero energy level and proposals for actions and requirements to help reduce greenhouse gas footprint during the building's service life.
- Green Materials Guide. Green Building Council 2020. Provides a summary of environmentally-friendly materials selection. May form a basis for specific materials requirements in the manual.
- ECOproduct. The revised system may make it a tool for specific requirement levels for reuse and recycling of materials.
- Paris-Proof concept. Green Building Council. Possible starting point for minimum requirements for climatic impact of buildings.
- Guidance: Planning for less waste Norwegian Green Building Council 2017. Advice on how to set waste targets, key figures for waste quantities which may form a basis for target figures. Strategies for reducing waste quantities which may form a basis for requirements in the manual.
- A framework for circular buildings. Indicators for possible inclusion in BREEAM – Dutch Green Building Council 2018. GAP analysis of BREEAM compared to circular principles. Good checklist for ensuring we have included all circular factors in the issues.
- The EU taxonomy for sustainable finance has certain minimum requirements for buildings to permit definition as sustainable and eligible for green loans:
 - Must ensure that at least 80 % of building and demolition waste can go to reuse or recycling of materials.
 - At least 80 % of all integrated wood materials must come from reuse or be FSC/PEFC certified.
 - May not contain environmental toxins defined by REACH.

Possible basis for minimum requirements for all buildings and for higher certification levels.

- ZEN Report 2020: Greenhouse gas requirements for use of materials in buildings.
 - Development of basis for setting absolute requirements for greenhouse gas emissions from use of materials. Possible basis for replacing reference buildings with absolute requirements.
- FutureBuilt ZERO. Criteria for low emissions buildings 2020
 - Criteria for greenhouse gas emissions from buildings from use of energy and materials. Definition of low emissions buildings with gradual tightening of requirements up to 2050. Possible basis for minimum requirements for higher certification levels.
- FutureBuilt's criteria for circular construction 2020.
 - Define circular buildings with requirements for the proportion of reused materials and reusable materials and components in the building.
- Specialist EU reports on the circular economy.
 - EU measurement system for circularity. 10 indicators. Eurostat has drawn up a circular materials use rate based on this.
 - Circular Economy Principles for buildings design. Possible checkpoints for ensuring that all aspects of circularity are covered.
- Socio-economic analysis of reduced waste in the building industry, Norwegian Institute of Bioeconomy Research 2020.
 - Analysis of the most socially effective measures for reducing the amount of waste in the building industry. Waste minimisation is best carried out prior to increased re-use and recycling of materials.
- EU plans and targets:
 - Waste Directive 2015: Target for 70% of all waste to go to materials recycling before 2020.
 - Green Deal 2019. EU's green growth strategy. How to achieve the goal of climate neutrality in 2050? An umbrella for many subsidiary plans and strategies. Key words: climate legislation, greenhouse gas reduction plans, climate pricing of imports, action plans for the circular economy, regulatory changes and stimulation of markets. There are also measures for supporting processes such as finance, budgeting, state aid systems, reporting, etc.

7.3 Questionnaire to producers and distributors of building materials

In Autumn 2020, in cooperation with Enterprise Federation of Norway and the Norwegian building materials trade association, a questionnaire survey was carried out among producers and distributors of building materials regarding sustainability. The aim was to investigate how far suppliers are ready to meet the stricter requirements of BREEAM-NOR. 24 responses were received. 15 of these were from building materials producers and 8 were distributors. 4 were from the category "other". The results are given below. On the basis of the responses, the following conclusions can be drawn:

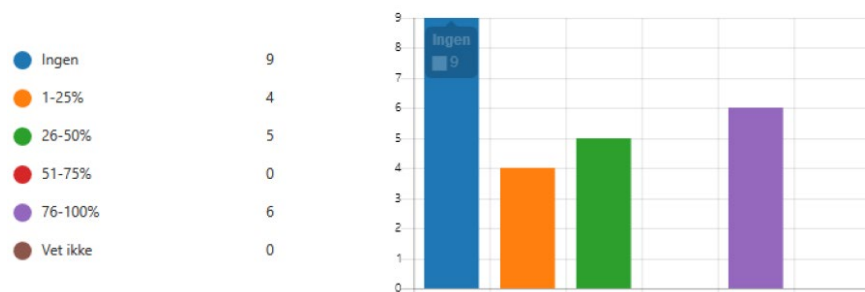
- EPD: It is hardly an exaggeration to say that most products do not currently have EPD. Some players are clearly better than others and have EPD on practically all their products.
- Documentation of emissions and substances on the A20 list: Many manufacturers and distributors have this under control.

Summary of inputs to BREEAM-NOR 2021

- Demountable products: Manufacturers and distributors show limited adaptation of their products for disassembly and reuse. Products of interest here are walls, doors and windows, and some heating, ventilation and sanitary equipment.
- Rental/leasing of products: Business models for leasing or rental of building products were little used or known about.
- Green supply chains: Many of the respondents were able to document their own environmental performance and that of their main supplier. At the secondary supplier level, only a few were able to document environmental performance.

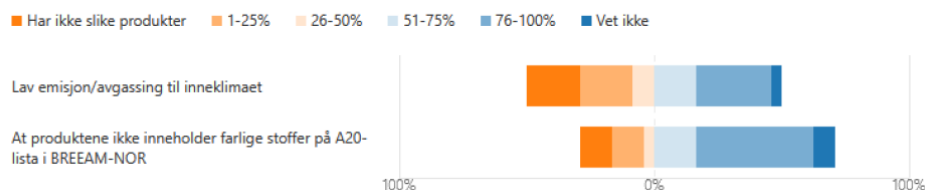
Cirka hvor stor prosentandel av produktene deres basert på omsetningsvolum har EPD? Hvis du ikke vet hva en EPD er, kan du finne mer informasjon her: www.epd-norge.no

[Flere detaljer](#)



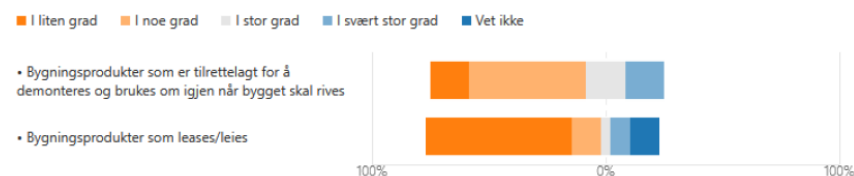
3. Cirka hvor stor prosentandel av produktene deres basert på omsetningsvolum har dokumentasjon for følgende miljøkvaliteter?

[Flere detaljer](#)



4. Det grønne skiftet vil antakelig føre til andre produksjonsmetoder eller forretningsmodeller. Kan dere for områdene under, beskrive i hvor stor grad deres virksomhet er klare for å tilby disse løsningene i dag eller i nærmeste fremtid?

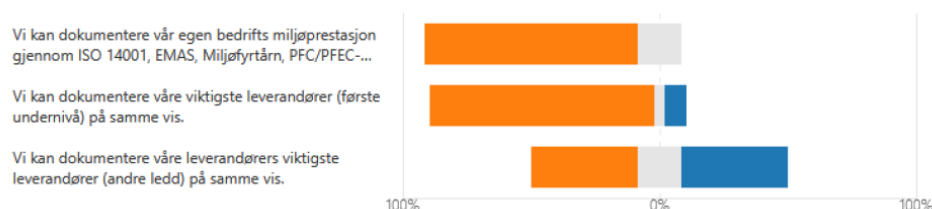
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6. Hvor godt kan din bedrift dokumentere egen miljøprestasjon og leverandørers miljøprestasjon?
Med dokumentasjon menes ISO 14001, EMAS eller Miljøfyrtårnsertifisering eller miljøsertifisering av produktene som leveres.

[Flere detaljer](#)

■ JA ■ NEI ■ Vet ikke



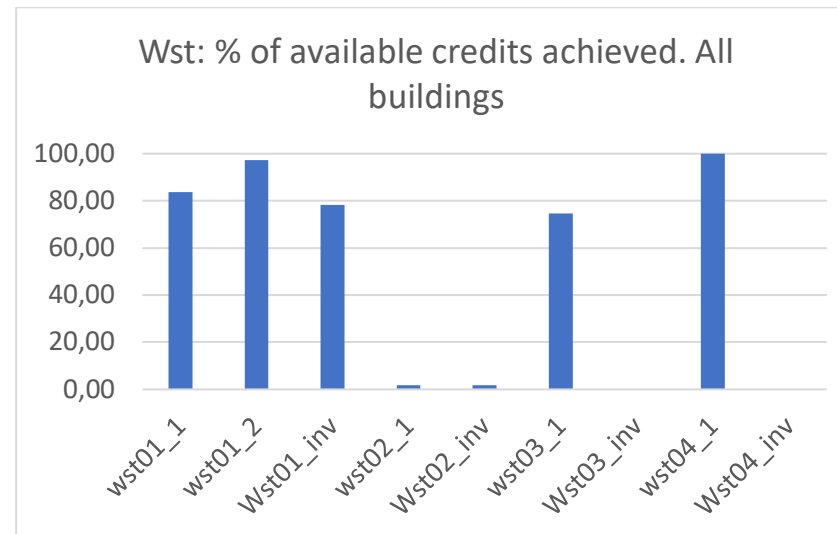
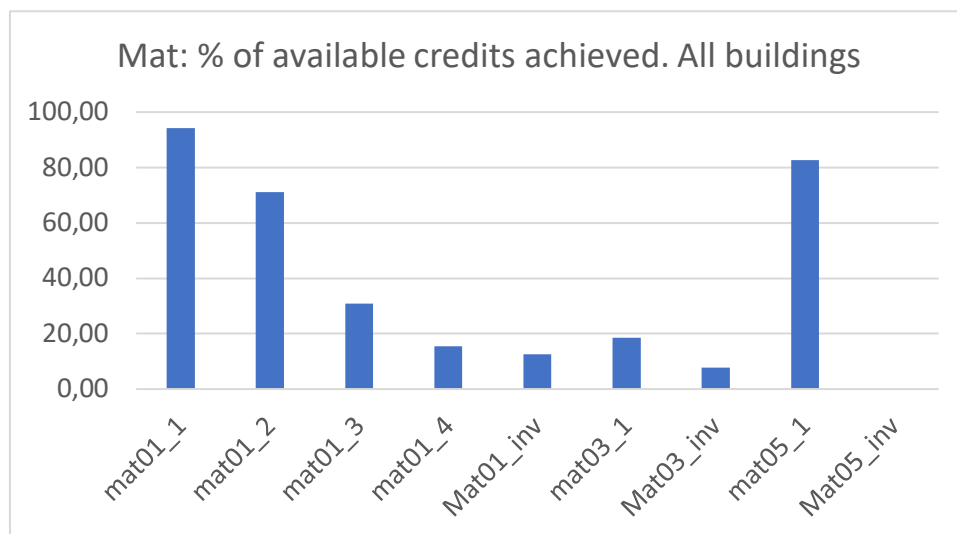
7.4 Current manual – chapter statistics

The table below shows a summary of the issues in this chapter where projects often or rarely achieve credits. Following the table is a graph showing the same per credit for each issue. The table also shows the issues which have the most frequent technical questions or clarifications or where assessors most often note a QA deviation. The table additionally shows the most important findings from a survey in which APs and assessors were asked about the individual issues in the manual.

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	Average credits score	Frequent technical questions	Frequent technical queries	Frequent QA NC's	Hard to interpret	Easy to interpret	Hard to achieve	Easy to achieve	Significant documentation costs	Significant execution costs	Low environmental effect
Mat 01	47 %	X		X		X					
Mat 03	19 %	X									
Mat 05	83 %					X					
Wst 01	93 %					X					
Wst 02	2 %				X						

Issue	Analysis of assessors' reports	Technical questions and clarifications and QA			Assessor and AP survey						
	Average credits score	Frequent technical questions	Frequent technical queries	Frequent QA NC's	Hard to interpret	Easy to interpret	Hard to achieve	Easy to achieve	Significant documentation costs	Significant execution costs	Low environmental effect
Wst 03	89 %			X		X					
Wst 04*	100 %*					X					

*Wst 04 is not available for domestic buildings



7.5 Feedback from the input phase - Materials (MAT)

In spring and autumn 2020, the Norwegian Green Building Council held numerous meetings to gather input for the new manual. There were two main questions:

- What is working well or not so well in the current manual?
- What are your wishes for the new manual?

More than 500 persons took part, and a large number of useful inputs were received, though for practical reasons, not all of them can be mentioned below. The following are some of the most important feedback responses, broken down by chapter issues.

Issue	Input
General	
	Materials with recirculated content should be requested.
Mat 01 Sustainable materials selection	
Criterion 1 A20 list	Questions relate to various types of documentation for substances which are harmful to health and the environment, HEA02, A20, EPD, ECOproduct, Svane, Sintef Technical Approval. These should be harmonised.
	The requirements are maybe OK, but the documentation requirements could be improved. Cheaper, quicker, better. Don't want special solutions with self declaration forms.
	The taxonomy requires documentation of several substances and products, and this suggests that A20 should be expanded.
Criterion 2 EPDs	EPD: The requirement should be stricter and we should now be setting requirements for performance.
	Unfortunate that EPD for paint is also included. Paint has little or no significance for materials selection in building.
Criteria 5-6 Performance requirements for building products	ECOproduct: Here we can exploit the small nuances better – ECOproduct provides lots of info about products, and the criteria could be more nuanced.
Greenhouse gas emissions	The product level is important, but the big changes happen at the concept level. Architects need to be challenged to redirect their focus, to lightweight solutions, for example.
	Could we have the framework requirements method for different building types, in the same way as in

Issue	Input
	the energy regulations? Perhaps we could propose some product types/measures with the same effect?
	BREEAM should be coordinated with Powerhouse's Paris Proof definition and FutureBuilt's Paris Proof definition. Currently quite a lot is unclear, so the projects hesitate to go in and tackle the problems.
	Most of them feel that greenhouse gas emissions are one of the most important areas in BREEAM-NOR. More space should be dedicated to this, and more credits given. Greenhouse gas calculations should be weighted higher.
	Could BREEAM be a measurement tool to determine whether the building trade is building in accordance with the Paris Agreement?
	Innovation credits for a zero emissions/fossil-free building.
	Important that the greenhouse gas methodology is as similar to the TEK method as possible.
Criteria 7-10 LCA - greenhouse gas account	Greenhouse gas emissions should be calculated in an early phase and in a simple manner.
	An agreed method for determining the reference building must be established. The FB Zero methodology is good. I like the way that reference buildings are not used. Unfortunately there is too much cheating with reference buildings in the market.
	BREEAM should take a stand on the storage of biogenic carbon. Reward carbon storage in materials, as this has great value as a climate measure over the building's lifetime. CCS for materials is probably complicated prior to demolition.
	Greenhouse gas calculations should be a minimum requirement in BREEAM-NOR.
	Want to see a combination of framework requirements and lists of measures.
	Scepsis about comparisons with reference buildings. Should go over to requirements for emissions per m ² , but this would require clear guidance as to what the calculation should include.
	If you calculated CO ₂ per workplace, this would reward space efficiency.
	Important to avoid sub-optimisation if reference standards are introduced. It is more important to raise awareness and perform suitable measures than just to achieve a number.
	It is seen as costly to set up/introduce greenhouse gas accounts.
	In some projects this is only done later in the project, as documentation of the materials choices and their greenhouse gas accounts. Full achieve only given for drawing up an account at the time it is done. Other projects use calculations from a previous phase to help approach a given greenhouse gas

Issue	Input
	reduction.
	The system limit should include outdoor areas and be cradle to grave.
	Can LCA calculations have a higher focus on other LCA environmental indicators other than just CO2/GWP?
	Landscape should be included in greenhouse gas calculations. Perhaps requirement for greenhouse gas calculation during LE?
	Important to have good guidance regarding useful measures. Many think that greenhouse gas calculation is too complicated.
	Greenhouse gas accounts for the whole building, not just for materials.
	Fossil-free bulk transport should be clearer in the greenhouse gas account.
	A study of eight pilot schools in Fremtidens bygg magazine and FutureBuilt shows that the benefit of correct choice of materials exceeds the energy benefit for the first 34 years of the building's life.
Criteria 13-14 Reduction of greenhouse gas emissions by 20 or 40 %.	Takes a lot of time to make the purchases suitable for achieving 20 %. The target price is set. Save money where you can. Slightly dearer for a great many products.
	Minimum requirement should be introduced for reduction of greenhouse gas emissions: Very Good = 10 % = 1c, Excellent 20 % = 2c and Outstanding 30 % = 3c.
	Should give 12 credits for greenhouse gas reduction, in the same way as for Ene 01. For example 20 % improvement -> 2 credits 30 % improvement -> 3 credits 35 % improvement -> 4 credits 40 % improvement -> 5 credits 45 % improvement -> 6 credits 50 % improvement -> 8 credits 60 % improvement -> 10 credits 70 % improvement -> 12 credits
	It would be better for greenhouse gas reduction intervals to match the energy label. Minimum requirements for the top three levels would be welcome.
	The reference values should be tightened up gradually/annually in order to reach the national climate

Issue	Input
	targets.
	Paris Proof. Comprehensive greenhouse gas account for the project (not just materials). Delivering a climate account should be a minimum requirement – so that credits can be won depending on how low you get.
	Greenhouse gas reduction of 20% from materials should be a minimum requirement (at least to achieve Good or Very Good).
	The ordering entity's CO2 requirement is important. This makes it easier to price. Have not experienced developers ordering this.
	Could have high environmental value, but high threshold for scoring credits.
	The credits are not achieved because of fear of higher construction cost and process costs. People start with the low-hanging fruit. That gives the least uncertainty.
	A lot of work to achieve credits. Prefer to go for other, easier, credits.
	Property developers do not have much of an interest in this. Costs money and property developers don't ask for it specifically. High-ambition projects are keen to go for this credit.
Mat 03 Responsible purchase of materials	
Minimum requirement	With regard to certified timber, we experience a great deal of misunderstanding and poor practice with regard to documentation. Documentation of certified timber can only be done by companies which are themselves certified. Perhaps the Green Building Council should consider stricter control of practice.
	Generally, there is too little competence in municipalities and various clients for them to be aware of how important and difficult this is, if these requirements are not laid down at an early stage.
	Manufacturer: It is a myth that MAT03 is difficult to document. We have all the necessary information/documentation in place.
	Mat 03: Not talked about. Not very attractive. Easy to achieve the first credit. That rewards good manufacturers.
	Difficult to understand. Difficult to communicate project to and motivate suppliers.
	The calculator leaves room for improvement. It is too undetailed and does not permit all materials in the building part to be broken down. Some have made their own Excel spreadsheets at a three-digit level in order to include all the materials. Necessary to have a parallel account and a separate strategy. Hard work to import documentation from the whole production chain.

Issue	Input
	Private developers go after the “low-hanging fruit”. This credit is not one of them...
	Unless the client has stated that this issue must be pursued, this will typically be one which the contractor passes over.
Mat 05 Resilient construction	
	Resilient construction, as the issue is formulated today, is not perceived as an added environmental benefit, as it is something which is often included regardless.
	The first part, on humidity, is OK, but could perhaps be part of Hea 09.
	Other parts are extremely specific, which is an advantage. Could perhaps be seen in connection with Man 02, covering LCC, as it relates to replacement of building parts, which is a standard item in the chart of accounts for NS 3454.

7.6 Feedback from the input phase - Waste (Wst)

Issue	Input
Wst 01 Waste managing on the building site	
	Lays down requirements for maximum waste volumes.
	Divert focus from degree of waste sorting to waste reduction. Project designers take little responsibility with regard to waste minimisation. Possible to get them to be more active?
Criterion 7 Pre-demolition survey	Think before you demolish – “demolition shame”. On demolition: percentage reuse of demolition materials.
	Criterion 7 in Wst 01 should be a separate credit.
	More focus on reducing waste quantities would mean that the issue is seen as giving a greater environmental benefit.
Criteria 8-9 Sorting at source on the building site	Waste management has a direct economic upside. Better sorting gives better economy in almost all cases. Requirements for waste handling are also included in other official requirements and may be stricter, for instance in the client’s requirements for the contractor.
	Increasing all levels of sorting rates by 5%.
Exemplary level Over 90% sorting at source	This is not all that ambitious. Sorting of waste is a familiar idea in the industry and easy to understand compared to many other issues.

Issue	Input
Minimum requirement	The minimum requirement for Outstanding 1 credit is too simple. Could be omitted.
Wst 02 Recirculated aggregate	
General	A number of feedback reports have been received that Wst 02 is hard to interpret and to achieve credits on. In all probability, the issue will be removed from the BREEAM International manual. These inputs have therefore not been included in the summary.
Wst 03 Waste in operating phase	
	The issue adds value. Good to have an area set aside for sorting.
Wst 04 Choice of floor covering and ceiling	
	Easy credit to achieve: Agreeing on ceiling and floor is easy.
	Requirement could be more ambitious. Rather too easy.
	In theory simple, in practice, hard to get the client to agree to.

7.7 Feedback from the input phase – Circular economy, designed adaptability

Issue	Input
	A digital twin is vital for establishing future reuse.
	Include reuse – use materials from other building sites.
	Both design/organisation and actual reuse should be rewarded in a separate issue.
	Circular economy and reuse must be rewarded more.
	Reformulate the requirement in Wst 02 to give credits for use of recirculated asphalt – easy to make this work by reference to the Norwegian Public Roads Administration manuals.
	Wood is the only truly circular/renewable material.
	Flexibility of area solutions must be rewarded more.
	Lack requirements for reuse/recycling.
	Reward for co-use/multiple use – the number of hours per day in which the built area is in use.
	BIM model supplemented with data on which materials are where, requirements for maintenance, dismountability, etc.
	Register building elements in reuse databases.
	Credits should be awarded for collating all necessary documentation for later reuse of an element.

Issue	Input
	How large a proportion of the building's materials can be disassembled, and extra credits for reuse guidance. Documentation of lifetimes.
	Promote use of rentals, e.g. of technical equipment. In this case the technicians will be responsible for dismounting, e.g. on change of tenancy. E.g. lighting (Philips) or lift.
	Reward decisions to retain the building rather than demolish. E.g. 20 %, 40 % etc.

7.8 Other countries' BREEAM manuals

BREEAM is a worldwide certification scheme. The following is a comparison of the international BREEAM manual, the British version and the Dutch version. The latter two are of later date and may therefore contain inputs to BREEAM-NOR 2021.

Issue	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
Mat 01 Sustainable materials selection			
LCA analysis		<p>Up to 6 credits available.</p> <p>In two parts: Credits for LC analysis of climate shell and for fit-out work and external areas. LCA must be performed at the project brief and be updated in the project design phase.</p> <p>May perform a simpler LCA analysis with a simple LCA tool (for fewer credits)</p> <p>Exemplary level credit:</p> <ul style="list-style-type: none"> • LCA on technical plant • Analysis of LCA and LCC together • Third party approval of LCA analysis 	Calculates climate costs per m2 usable floor space in LCA analysis. Has a national system for this.
			Credits for products with materials passport
EPD		Has a calculation method for recognising EPDs. See	

Issue	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
		description in chapter about changes in the new international manual.	
			LCA cost analysis and materials passport are minimum requirements for all certification levels.
Mat 03 Responsible purchase of materials			
	1 credit for establishing and following a sustainable purchasing plan for the project. Includes assessment of potential for local suppliers.	1 credit for establishing and following a sustainable purchasing plan for the project. Includes assessment of potential for local suppliers.	1 credit for establishing and following a sustainable purchasing plan for the project. Includes assessment of potential for local suppliers.
Mat 05 Resilient construction			
		Separate criterion for roof construction to avoid water damage and ponding.	
		The criterion for construction protection must also include measures for protection against vandalism.	
Mat 07 Design for reuse			
			Has a separate index for dismantability. Calculated for the whole building. Requirement for this to be over 40%. Exemplary level: over 60%
			Requires a digital dismanting manual
Wst 01 Waste handling on the building site			
Demolition and reuse		Separate credit for feasibility study prior to demolition. Indicates the stage at which the study must be made.	Credit if at least 80% of waste is reused in its current form in either this building or another project, or if it is to be reused/recycled by the supplier or the recycling company. Exemplary level is achieved if 90% is reused or

Issue	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
			recirculated.
Waste targets		Targets for waste volumes. Up to 3 credits, depending how low a target is set and achieved.	
Sorting at source		The sorting at source requirement differentiates between projects with demolition, without demolition and construction pit.	
		Separate sorting at source requirements for what are defined as “simple buildings”.	
Wst 06 Functional flexibility			
			Calculates functional flexibility. Credits depend on the percentage achieved. Separate tool for this: functional flexibility

7.9 Conclusion

Most important findings and necessary changes

- Many would like to see stricter minimum requirements for climate reduction, e.g. greenhouse gas accounts.
- It should be considered whether a measures list could be a minimum requirement or attract credits.
- Reduction of greenhouse gas emissions from materials is important and should be given more credits in BREEAM-NOR.
- Circular economy should be covered better in BREEAM-NOR.
- BREEAM should be adjusted to the new directives and plans from the EU.
- The Dutch manual has several interesting methods to consider, but the international manual will probably cover most of the measures.
- It should be considered whether FutureBuilt’s criteria set could form the basis for minimum requirements for the top certification levels.
- Waste minimisation must be rewarded.
- Sorting criteria are too simple and must be made stricter.
- Requirements for EPDs must be tightened as so many EPDs are available.

- It must be possible to use BREEAM to check that the principles of circular building have been secured through issues and requirements.

Areas which should be kept as they are

- Wst 03 on waste sorting in the operating phase functions correctly and can be continued.

8 Land Use and Ecology (LE)

8.1 Anticipated changes to the international manual

BRE has announced the following changes to the issue:

Issue ID and name	Main contents
General	<p>The whole chapter is to be adjusted to the breakdown and method in BREEAM UK 2018.</p> <p>Breakdown of the issue according to the following method:</p> <ol style="list-style-type: none"> 1. Understand and identify 2. Protect 3. Reduce or limit negative impacts 4. Minimising, compensating and improving 5. Maintaining and managing <p>All issues are interconnected. Credits not available for LE 03 unless LE02 has been met.</p>
LE 01 Site selection	Only minor changes
LE 02 Ecological risks and opportunities	<p>Former title: Ecological value of the site.</p> <p>Identify ecological value according to set criteria. The result determines which of the two alternative documentation methods the project will choose: basic or comprehensive. This in turn will determine the scope of the ecologist's work.</p>
LE 03 Limit ecological impact	<p>Former title: Ecological value of the site, but expanded</p> <p>Protection of threatened species within or connected with the action area before and after the building period.</p> <p>Two alternative routes:</p> <ul style="list-style-type: none"> • Basic: planned and limited impact. • Comprehensive: assistance from an ecologist in planning and avoiding impacts.
LE 04 Ecological changes and improvements	<p>Former title: Improvement of the site's ecological value</p> <p>Two routes, of which the comprehensive route includes input from third parties. Measures within the area also, not just on the site.</p> <p>Extra credits if it can be documented what effect the measures have had for the site's ecological value.</p>
LE 05 Long term ecological	Former title: Long term effect on species diversity

Issue ID and name	Main contents
management and maintenance	More points can be gained if the project plan extends to 3 years after building completion (5 years in the current manual).

8.2 Trends, analysis and reports

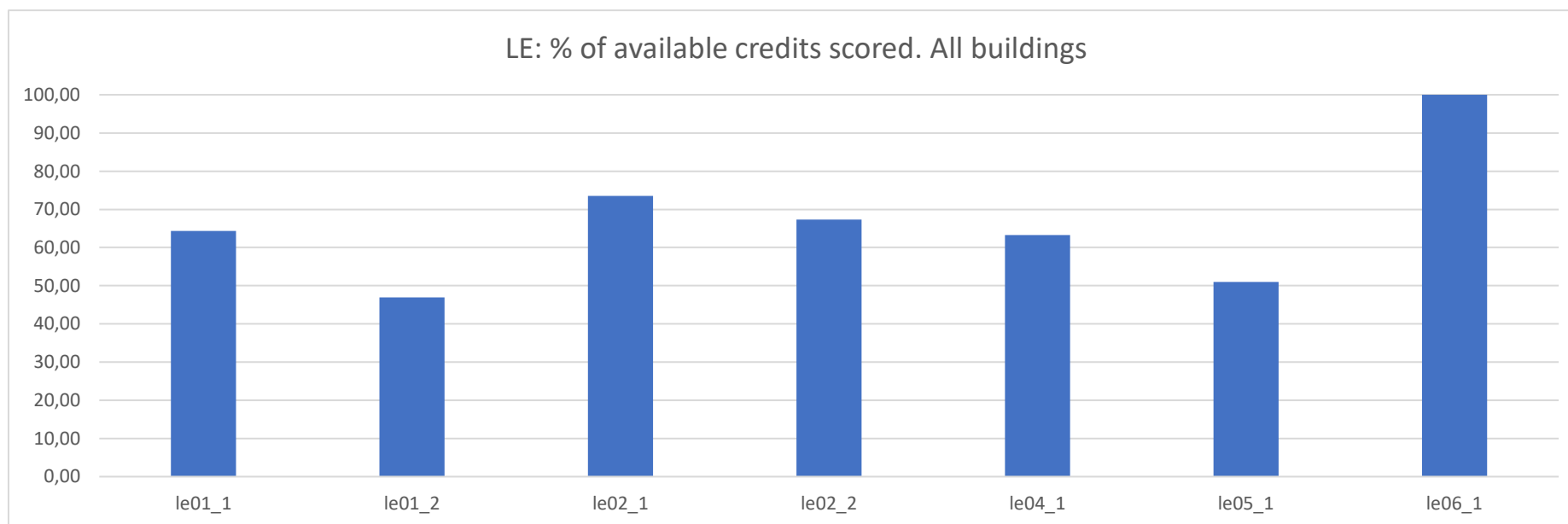
- FutureBuilt's criteria for maintaining and strengthening natural diversity
- EU taxonomy of sustainable finance
 - Must be resilient against extreme precipitation and flooding and against higher temperatures
 - Cannot be built on contaminated land
 - Cannot be built in nature conservation areas – see definitions in the report
 - Cannot be built on land with high agricultural value
- Norwegian Public Roads Administration Report no. 387, "Harmful alien species"
Report describing measures for planning and building to ensure absence of harmful alien species
- Sweco report: Feedback to the Norwegian Environment Agency's "Impact assessment of climate and environment topics"
- A criteria set for assessment and highlighting of greenhouse gas emissions and climate adaptation in the Oslo planning process
 - Retain existing green structure and elements, including large trees, woodland, bogs and soil with high carbon content
 - Where carbon-containing green structures are lost, these must be replaced
 - Consideration of whether alternative local areas could be used, with lower emissions
 - Conserving, developing and expanding blue-green elements and corridors, and ensuring a continuous blue-green structure with higher biological diversity
 - Choice of typical local species and description of how this is organised for higher biological diversity
 - Assessment of how the area is linked to the surrounding blue-green structure
 - Validation of blue-green factor
 - Managing surface water openly and locally on the actual site and in an area perspective by following the three-stage strategy – checking climatic factor details and the rain intensities to be used
 - Plan for local, low carbon handling of earth masses
 - Assessment of shared planning with properties close by for local redispal of earth masses
- City of Oslo "Standard for blue-green factor in Oslo housing projects"
- City of Oslo "Standard for blue-green factor in Oslo housing projects"

- City of Oslo “Blue-green factor in Oslo housing projects – user guidance for the standard”
- City of Oslo “Fact sheet on surface water management”
- City of Oslo “The city’s trees”
- Ministry of Climate and Environment “Species database”
- City of Oslo “Solar cell chart for Oslo”

8.3 Current manual – chapter statistics

The table below shows a summary of the issues in this chapter where projects often or rarely achieve credits. Following the table is a graph showing the same per credit for each issue. The table also shows the issues which have the most frequent technical questions or clarifications or where assessors most often note a QA deviation. The table additionally shows the most important findings from a survey in which APs and assessors were asked about the individual issues in the manual.

Issue	Analysis of assessors' reports	Technical questions and clarifications and QA			Assessor and AP survey						
Average credits score		Frequent technical questions	Frequent technical queries	Frequent QA NC's	Hard to interpret	Easy to interpret	Hard to achieve	Easy to achieve	Significant documentation costs	Significant execution costs	Low environmental effect
Le 01	60 %					X					
Le 02	70 %					X					
Le 04	63 %					X					
Le 05	51 %										
Le 06	100 %										



8.4 Feedback from the input phase

In spring and autumn 2020, the Norwegian Green Building Council held numerous meetings to gather input for the new manual. There were two main questions:

- What is working well or not so well in the current manual?
- What are your wishes for the new manual?

More than 500 persons took part, and a large number of useful inputs were received, though for practical reasons, not all of them can be mentioned below. The following are some of the most important feedback responses, broken down by issues in the chapter.

Issue	Input
General	Often only one report is supplied covering several of the ecological issues. Could consider combining the ecological issues into one issue.
	Biological diversity needs to be rewarded more highly. Gives high value.

Issue	Input
	Ecology credits are very much dependent on what advice the ecologist gives. And ecologists differ in their advice. But in all cases, the values added exceed the statutory requirements. The ecology credits are maybe the most unique and are quite clearly driven by BREEAM-NOR.
	There should be a minimum requirement in the ecology chapter for several certification levels.
Le 01	Site selection
General	A few feel that LE 01 should be omitted as it has nothing to do with buildings.
Criterion 1 Building on previously developed areas	Simpler for building in areas near to towns. Can be difficult for campus areas. Educational buildings are often located in more rural areas.
	Often certification is not decided on at an early enough phase. Housing which is BREEAM certified is usually developed by housing departments who know at an early stage they they will be requesting BREEAM certification.
Criteria 2-4 Building on contaminated land	APs and assessors report that it very much depends on the project whether it is easy or hard to achieve credits here.
	Minimisation of the building's footprint should be rewarded.
Le 02	Ecological value of the site
General	The ecologist should be involved in earlier phases.
	The measures should be delivered on a mapped site (SOSI), both in project design and after building completion.
	The situation has improved, but feedback from the ecologist is still not working optimally.
Criterion 1 The ecologist defines the area as an "area of low ecological value"	The BREEAM system ought to have a methodology for detecting urban ecological values in a uniform way. The Environment Agency and the Green Building Council should clarify who is responsible for the methodology.
	The BREEAM method should recognise elements which are also described in local and regional action plans as areas or elements of ecological value, even when they already exist on the site.
	A very few APs and assessors think that even though the involvement of the ecologist in projects has improved, it is still not optimal. These credits are very much dependent on what advice the ecologist gives, and this is very variable. But in all cases, the values added exceed the statutory requirements. The ecology credits are maybe the most unique and are quite clearly driven by BREEAM.
	Some APs and assessors feel it is hard to achieve credits for educational buildings because the ecologist is involved too late in the project – because of the wait for the political decision to agree/order the project. It is

Issue	Input
	easier to get an ecologist involved at an early stage in housing projects.
	The described method for assessing ecological value has been omitted. Instead the Norwegian Public Roads Administration's Guidance V712 Impact analysis is recommended. In addition, free edge zones along roads, blue/green areas and permeable surfaces should be included.
Criterion 2 Ecological protection	It should be assessed whether valuable habitats (submerged rocks, ponds, watercourses, ground conditions, etc.) and vegetation must be preserved during development.
Le 04	Improvement of site ecology
General	The measures should be delivered on a mapped site (SOSI), both in project design and after building completion.
	If the existing situation is not preserved, it is hard to justify "improving" the ecology (as is done today). The items "maintenance" and "improvement" should be split into two issues.
	It would be desirable for the issue to better reflect the white paper Meld. St.14 (2015–2016): <ol style="list-style-type: none"> 1. Avoid negative impact 2. Remedy 3. Restore 4. Compensate (not part of current BREEAM)
	Some feel that LE04 should be a precondition for awarding LE05.
	BREEAM requires a signed declaration by an ecologist that the law has been followed. However, the ecologist is not based in the project organisation and is unable to monitor whether the law is being followed.
Criteria 1-2 Ecologist's improvement recommendations	<p>Some specific inputs for measures which should be rewarded:</p> <ul style="list-style-type: none"> • To the maximum extent, maintain and strengthen existing waterways and valuable natural diversity. • Invasive alien species must be removed. We see clear consequences from the import of plants which constitute a significant ecological risk to Norwegian nature. • Higher focus on typical local vegetation. • Risk and vulnerability analysis/impact analysis on the consequences of measures: what is the consequence of omitting to open up streams? What is the consequence of constructing a building which alters local climatic conditions (e.g. overshadows valuable natural habitats)? Natural diversity and potential for surface water management must be seen in combination and identified early. • Prevent destruction of carbon-holding soil (bogs, topsoil etc.) • Long-lived plant life is sustainable and plant quality should be part of the specification of requirements. This

Issue	Input
	<p>covers both plant health and toleration of the climate the plant is to live in. Otherwise it will be necessary to replace plants which have not survived because they did not have the right conditions. Both costly and non-sustainable.</p> <ul style="list-style-type: none"> It can be tempting to select imports for financial reasons, but shorter transport routes are sustainable. <p>On larger construction sites, it is often specified that “E-plants” must be used, as this is the only certification scheme guaranteeing what is planted in the ground.</p>
Le 05	Long term effect on species diversity
pre-requisite and Criteria 1-3 Management plan for 5 years after completion of building	Some APs and assessors feel that the 5 year tied period is too long, while others feel it is too short and should be expanded to the whole of the construction’s service life.
Criteria 4-5 Two supplementary criteria defined under LE05 have been implemented.	Some APs and assessors feel it is hard to achieve the supplementary credits in addition to the management plan.
Criteria 6-11 Four supplementary criteria defined under LE05 have been implemented.	The issue becomes very wide-ranging if several of the supplementary criteria are relevant. Becomes very dependent on the project’s ecologist. Criterion 11 is very wide-ranging.
Le 06	Building footprint
Criterion 1 (residential) Credit for minimised footprint	No comments, even though all domestic buildings achieve credits here.

8.5 Other countries’ BREEAM manuals

BREEAM is a worldwide certification scheme. The following is a comparison of the international BREEAM manual, the British version and the Dutch version. The latter two are of later date and may therefore contain inputs to BREEAM-NOR 2021.

Issue	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
Le 02	Ecological value of the site	Changed to “Ecological risks and opportunities”	
		pre-requisite: The customer or	This is a minimum requirement from

Issue	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
		<p>contractor must confirm agreement and monitoring against the applicable regulations.</p> <p>Possible to choose two routes: “Basic” for sites with low existing ecological value, which can be implemented without an ecologist. “Comprehensive” for all types of site involves an ecologist and a project coordinator who will implement the ecologist’s recommendations. The ecologist’s recommendations must also take account of the impact on local climate and on seeing the value of what was already on the site. The report must also show agreed project targets such as long lifetime, low maintenance requirements, etc.</p>	Pass upwards.
Le 04	Improvement of site ecology		
		LE03 is a pre-requisite for LE04.	This is a minimum requirement from Pass upwards.
Le 05	Long term effect on species diversity		
		Possible to choose two routes: “Basic”, where negative impact on the site must be minimised before and during construction. “Comprehensive” assessment, where an ecologist must be involved in order to minimise impact	This is a minimum requirement from Pass upwards.

Issue	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
		on the site.	
Le 06	Building footprint		
Criterion 1 (residential) Credit for minimised footprint	Not included	Not included	Not included
Le 03			
(New issue) Managing impacts on ecology		<p>pre-requisite: Identification of ecological risk and opportunities, i.e. LE02</p> <p>Credit for planning and measures on site. Further work with LE02. Safeguarding during project design and construction. The project must report results.</p> <p>Credits for protection and minimisation of negative impacts during site preparation and construction.</p>	

8.6 Conclusion

Most important findings and necessary changes

- Consider whether the assessment method for sites of ecological value should be better coordinated with the Environment Agency's method.
- Look at more sides of the ecology concept: waterways, local climate conditions, etc.
- To a large extent, the issues may be connected or can be combined.
- Consider minimum requirements for ecology for the higher certification levels.

- Ecologist's responsibility and involvement should be better defined.
- LE 05 is felt to be very wide-ranging. No projects achieve a full score here.

Areas which should be kept as they are

- None

9 Pollution (POL)

9.1 Anticipated changes to the international manual

No major changes to this chapter have been planned in the international manual. One exception is that Pol 03 Surface water management is being moved to the new chapter Resilience. The inputs to this issue are treated here.

9.2 Trends, analysis and reports

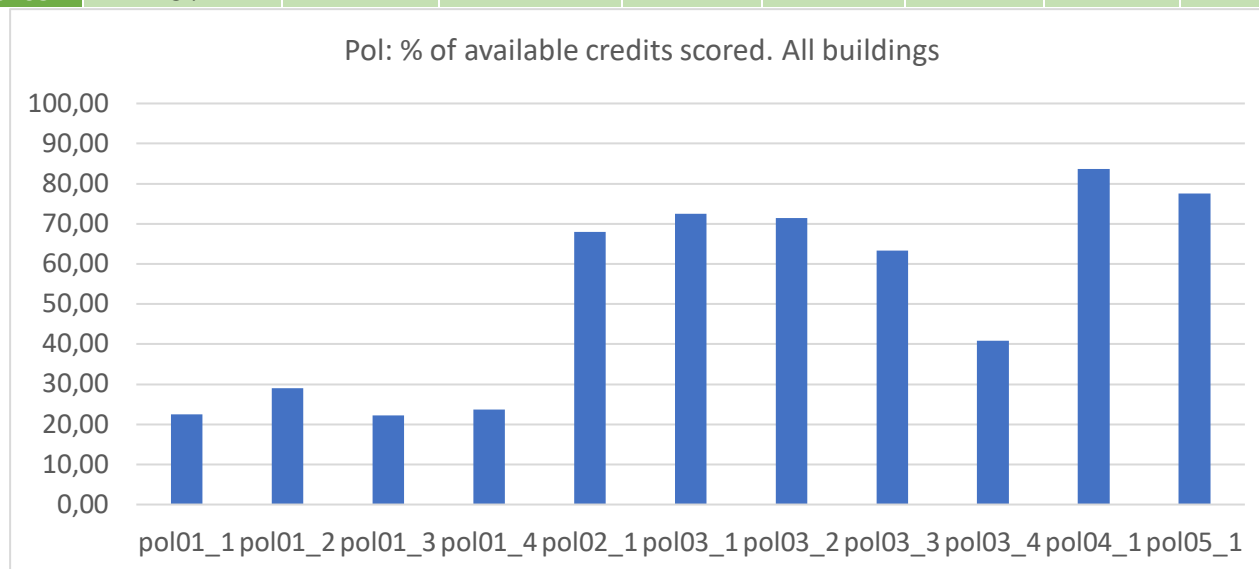
- The regulation on the prohibition of the use of mineral oil for heating buildings bans the use of oil for building heating, which means that NOx emissions from buildings will be insignificant.

9.3 Current manual – chapter statistics

The table below shows a summary of the issues in this chapter where projects often or rarely achieve credits. Following the table is a graph showing the same per credit for each issue. The table also shows the issues which have the most frequent technical questions or clarifications or where assessors most often note a QA deviation. The table additionally shows the most important findings from a survey in which APs and assessors were asked about the individual issues in the manual.

Issue	Analysis of assessors' reports	Technical questions and clarifications and QA			Assessor and AP survey						
					Hard to interpret	Easy to interpret	Hard to achieve	Easy to achieve	Significant documentation costs	Significant execution costs	Low environmental effect
	Average credits score	Frequent technical questions	Frequent technical queries	Frequent QA NC's							
Pol 01	48 %										
Pol 02	68 %				X						
Pol 03											
Pol 04	84 %				X						

Issue	Analysis of assessors' reports	Technical questions and clarifications and QA			Assessor and AP survey						
	Average credits score	Frequent technical questions	Frequent technical queries	Frequent QA NC's	Hard to interpret	Easy to interpret	Hard to achieve	Easy to achieve	Significant documentation costs	Significant execution costs	Low environmental effect
Pol 05	78 %				X						



9.4 Feedback from the input phase

In spring and autumn 2020, the Norwegian Green Building Council held numerous meetings to gather input for the new manual. There were two main questions:

- What is working well or not so well in the current manual?
- What are your wishes for the new manual?

More than 500 persons took part, and a large number of useful inputs were received, though for practical reasons, not all of them can be mentioned below. The following are some of the most important feedback responses, broken down by chapter issues.

Issue	Input
Pol 01 Impact of refrigerants	
General	Gives high value. Without this, conventional products are generally chosen.
Criteria 4-6 Leakage detection	Other credits may not be necessary. As there are very strict rules for project design with gas already. Are more expensive than the conventional solution.
	Criterion 6 seems more a clarification than a criterion.
Pol 02 NOx emissions	
	Is weighted too high. 1 credit would have been sufficient.
	The latest FAQ for district heating has made it easier to achieve free credits without doing anything extra. In other words, no added value from district heating, as the credit is awarded automatically. Even if the district heating is based on waste consumption or bio-energy, which have NOx emissions.
Pol 04 Reduction of light pollution	
	This is connected with the locality and how much light pollution there is now compared to previously. In a town, the issue has little value, but in the country, it may have a greater value.
	The issue is important and gives quality. Would like it to continue – but not necessarily made too easy.
	If you have worked with a consulting electrical engineer to select the correct lamps, Pol04 is easy enough to achieve, as long as you have made the right choices on equipment.
	POL04 should define more clearly what security lighting is. It will be hard for an assessor without lighting competence to understand the requirement.
Pol 05 Noise damping	
	The measure may involve significant extra costs if noise measurements need to be made.
	The value added is related to the locality. How much noise pollution there is now, compared to before. Has the greatest value if a new office building is being built in a location with little prior development.
	May be expensive if it requires extra measures (e.g. in rural areas, or heat pumps in residential blocks).
	The issue is important and gives quality. Would like it to continue – but not necessarily made too easy.
	If you are willing to take measurements, POL05 is easy to achieve.

9.5 Other countries' BREEAM manuals

BREEAM is a worldwide certification scheme. The following is a comparison of the international BREEAM manual, the British version and the Dutch version. The latter two are of later date and may therefore contain inputs to BREEAM-NOR 2021.

Issue	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
Pol 01 Impact of refrigerants			
			Non-refrigerants: defined to include off-site systems connected to the building
			Score 3 credits without refrigerants if Thermal comfort under Hea 03 is satisfied.
			Cold stores are always included, even if the amount of refrigerant is under 5 kg.
Pol 02 NOx emissions			
		Called "Local air quality" in this standard. Includes NOx, VOC and particle emissions (PM10).	Simple system for NOx emissions: Under 35 mg/kWh: 1 credit 0 mg/kWh: 2 credits
		Two alternatives: 1. Heating with electricity or systems not based on combustion 2. Systems based on combustion, but with emissions lower than the levels in the table.	District heating based on waste incineration does not attract credits.
		The table contains a definition of energy source, e.g. gas, oil or biomass.	
		Has other requirements for buildings in so-called High Pollution Locations, e.g. town centres, where such pollution is particularly undesirable.	
		District heating systems are exempted from requirements unless the project determines the	

Issue	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
		specifications for the district heating plant.	
Pol 04 Reduction of light pollution			
		Automatic credit if the building does not need outdoor lighting. Does not apply to security lighting.	Automatic credit if the building does not need outdoor lighting. Does not apply to security lighting.
		Specified that the requirement also applies to indoor installations set up to illuminate outdoor areas.	The issue applies only to commercial buildings. Not residential.
Pol 05 Noise damping			
		Does not include an obligation to consider buildings that will be built, as done in BREEAM.	
		5 dB lower both day and night. BREEAM-NOR has 3 dB lower in the day.	
		Noise-sensitive buildings: Must be assessed when they are in use. For example, a school does not need to fulfil the requirement at night.	

9.6 Conclusion

Most important findings and necessary changes

- The credits in Pol 01 refrigerants are rarely achieved compared to the other issues.
- Pol 02: The regulations on the prohibition of heating with mineral oil in buildings entail that NOx emissions from new buildings will probably be less important in the future. It should be considered whether the issue is still relevant.
- The definition of security lighting and requirements for it in Pol 04 should be clearer.

Areas which should be kept as they are

- Pol 02 NOx emissions, Pol 04 Reduction of light pollution and Pol 05 Noise damping are regarded as easy to understand. If they are changed, this clarity must be retained.

10 Resilience

This is a summary of the inputs and analysis to the new chapter “Resilience”. This includes issues from several chapters, with pollution, water, waste materials and health and internal environment.

10.1 Anticipated changes to the international manual

New chapter which looks at risk management in terms of resilience. Contributes to reduced risks for investors, building owners, users/residents etc.

Risk is defined as:

Physical risks	Transition risks	Social risks
<ul style="list-style-type: none"> •Flooding •Natural hazards •Water damage •Overheating •Intrusion 	<ul style="list-style-type: none"> •Changing functions •Technological changes •Market changes •Legal •Policy 	<ul style="list-style-type: none"> •Social disruption •Public health •Poverty •Modern slavery/forced labour

Definition of resilience: the ability of a property and its infrastructure to tackle acute shocks and chronic stress while adapting to changes over time.

The chapter includes issues from several chapters and also from BREEAM In-Use. The issues and main content are shown below.

Issues which are being moved to the Resilience chapter	Main contents
Pol 03 Surface water management	Includes several topics from BREEAM UK 2018. For example: pre-requisite that a person with approved skills is in charge of analysis. Solutions for surface water management must be adapted to the site. Different runoff criteria for developed and non-developed sites. Surface water management solutions must be adapted to industry best practice. In Great Britain this is SuDS. External areas for goods delivery and storage must be adapted to best practice for flooding and surface water.

Wst 05 Adaptation to climate change	Currently located in BREEAM International. Will be adapted to BREEAM UK 2018. Make a plan for managing climate changes. Must consult relevant professional bodies. In Norway this will be the Water Resources and Energy Directorate, the municipality, etc. Risk assessment of a long list of climate change effects. For example, flooding, wind storms, extreme cold and heat and drought. Consider how these scenarios will affect the building and property, and the associated risks. Set risk limits for measures and determine actions if the risk limit is breached.
Wst 06 Adaptable design	Will use the content of Wst 06 in BREEAM UK 2018. Issue in two parts: Adaptability and disassembly. Adaptability is being considered for inclusion in this chapter. Not yet completely decided whether to include it. Disassembly will most probably be put in the Resources chapter.
Mat 05 Resilient construction	Also mentioned as part of the Resources chapter. Unclear which chapter it will end in.
Hea 07 Natural hazards	No major changes planned, but must be seen in relation to Wst 05.
Social risk and opportunities	Taken from BREEAM In-Use. Security against cyber attacks. Potential for using the building as a cooling zone in heatwaves. Not really specified as yet.

10.2 Trends, analysis and reports

- EU taxonomy of sustainable finance. One of the minimum requirements is: must be resilient against extreme precipitation and flooding and against higher temperatures (with regard to internal environment)
- Framework for analysis and reporting of climate risk issued by Task Force on Climate Related Financial Disclosures (TCFD)
 - G20 countries have a Financial Stability Board. TCFD is a working group under this body and has made a framework for analysis and reporting of climate risk. Finance Norway has produced guidelines based on this, see below.
- Climate risk reporting – guidelines, Finance Norway – helps financial institutions to assess how climate change is affecting their company
- www.klima2050.no. Is a centre for research-driven innovation under the Norwegian Research Council. Researches methods for achieving risk reduction through climate adaptation of buildings and infrastructure. Humidity-protected buildings is one main area. Criteria formulations are available from it. Their work on water-triggered landslides and surface water management are also relevant for BREEAM.
- Criteria for assessment of climate impact in the planning process, Oslo Municipality 2020
 - Providing quality assurance that development is as far as possible constructed in a low carbon and climate-aware way.
 - Managing surface water openly and locally on the actual site by following a three-stage strategy

- How to address climate risk? Norwegian Climate Foundation and KLP Pensions. Give advice and tips to companies and commerce in managing climate change and stricter climate policies. Detailed guidance on how to go about assessing climate risk. May contribute to the BREEAM methodology.

10.3 Current manual – chapter statistics

The issues in this chapter are split between several chapters in the current BREEAM-NOR manual, while other issues will be new. The following shows the statistics for the current BREEAM-NOR manual.

Issue	Analysis of assessors' reports	Technical questions and clarifications and QA			Assessor and AP survey						
Average credits achieved		Frequent technical questions	Frequent technical queries	Frequent QA NC's	Hard to interpret	Easy to interpret	Hard to achieve	Easy to achieve	Significant documentation costs	Significant execution costs	Low environmental effect
Hea 07	42 %										X
Hea 09 Humidity protection	74 %										
Mat 05 Resilient construction	83 %					X					
Pol 03 Surface water management	65 %										

10.4 Feedback from the input phase

In spring and autumn 2020, the Norwegian Green Building Council held numerous meetings to gather input for the new manual. There were two main questions:

- What is working well or not so well in the current manual?
- What are your wishes for the new manual?

More than 500 persons took part, and a large number of useful inputs were received, though for practical reasons, not all of them can be mentioned below. The following are some of the most important feedback responses, broken down by issues in the chapter. **As Resilience is a new chapter, we have included inputs from the issues in the current BREEAM-NOR manual which are to be moved here. Inputs on climate risk are also included here.**

Issue	Input
Climate risk	
	Should be minimum requirements for climate risk, risk and vulnerability analysis, flooding and natural hazards.
	Early phase assessment of climate risk, including natural hazards. The measures that should be taken relating to physical risk, transition risk and liability risk. Applies both to the building and the area.
Hea 07 Natural hazards	
Criteria 1-2 Natural hazards	Most feel that the issue is easy to understand.
Hea 09 Humidity protection	
General	A good number of projects achieve credits here, and most APs and assessors feel that the requirements are easy to understand. Some feel that the documentation requirement entails a significant extra cost, but most see the environmental benefit of it.
	Could BIM models help to make the documentation process simpler?
Criteria 6-7 Roofed buildings	Some feel that the measures entail a significant extra cost, but most see the environmental benefit of it.
Pol 03 Surface water management	
	Proposal for changing the issue on surface water management: When assessing whether the building is to be awarded two credits: <ul style="list-style-type: none"> ○ The hydrology consultant must assess/calculate flooding levels/zones which could occur from flooding from rivers and the sea. ○ The hydrology consultant must assess/calculate whether there could be problems from other sources (surface water, ground water, drainage conduits, reservoirs, canals) and mention these in

Issue	Input
	the assessment. In this connection, the hydrology consultant must contact the municipality to hear if there are known problems with other sources. Where the municipality is unable to make a statement, hydrologists must make their own (simplified?) expert assessment.
	If the project needs to establish a detention basin to satisfy the criterion, this will lead to extra cost
	The building can be awarded two credits if it is in an area of low annual probability for flooding from rivers and the sea (outside the 1:1000 year flooding zone) and the hydrology consultant or municipality or hydrologist have not identified known flood problems in connection with other flooding sources. This means, for example, that a building outside the 1000 year flooding zone for rivers and the sea, but in an area where the municipality has identified a flood route for surface water run-off, cannot be awarded two credits. A building outside the 1000 year flooding zone from rivers and the sea, but which has a basement, can be awarded two points as long as the municipality has not indicated problematic high groundwater levels, all entrances to the basement are above the 1000 year flooding level from river/sea and the basement is of watertight construction.
	Should be an issue with a focus on establishing specific NATURAL measures for surface water. It would be great if BREEAM could help raise awareness about the need for a higher focus on future surface water problems.
Mat 05 Resilient construction	
	Resilient construction, as the issue is formulated today, is not perceived as an added environmental benefit, as it is something which is often included regardless.
	The first part, on humidity, is OK, but could perhaps be part of Hea 09.
	Other parts are extremely specific, which is an advantage. Could perhaps be seen in connection with Man 02, covering LCC, as it relates to replacement of building parts, which is a standard item in the chart of accounts for NS 3454.

10.5 Other countries' BREEAM manuals

BREEAM is a worldwide certification scheme. The following is a comparison of the international BREEAM manual, the British version and the Dutch version. The latter two are of later date and may therefore contain inputs to BREEAM-NOR 2021.

Issue	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
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Issue	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
Hea 07			
		Does not have Hea 07.	Does not have Hea 07. National legislation makes the issue irrelevant.
Wst 05 Adaptation to climate change			
	Exemplary level credit: Score the first credits + also several other identified issues. For example, at least 8 credits for Ene 01, Hea 07, Ene 04, 3 credits for Wat 01, etc.		
Mat 05 Resilient construction			
		The criterion for construction protection must also include measures for protection against vandalism.	Includes more factors than humidity: sun, wind, temperature, etc. Separate table – Mat 05.01 – indicates the factors to be assessed.
		Separate criterion for roof construction to avoid water damage and ponding.	Has defined building parts which are to be assessed in CN2 and the destructive effects which are to be assessed in CN3.
		Protecting building parts exposed to humidity damage: refers to standards for use in making the analysis.	
Pol 03 Surface water management			
			Minimum requirements for all certification levels: No runoff for up to 5 mm of rain. Runoff plan approved by the

Issue	BREEAM International New Construction 2016	BREEAM UK 2018	BREEAM-NL 2020
			authorities and made available to users.
			Up to 3 credits depending on the precipitation volume it is possible to retain on the site.

10.6 Conclusion

Most important findings and necessary changes

- With regard to the BRE definition of the concept of Resilience, the chapter needs to be expanded with new issues and criteria which cover the whole concept, e.g. cyber attacks.
- BREEAM-NOR does not have the issue Wst 05 Adaptation to climate change. This will be included in the new Resilience chapter and direct more focus to climate risk.
- The runoff requirements in Pol 03 in the Dutch manual could be an inspiration for clearer and/or stricter requirements for surface water management.
- Finance Norway has created a good tool for assessing climate risk, which can be used as a basis.
- The work of Norwegian innovation centre Klima 2050 on measures for controlling humidity in buildings could perhaps be used as a basis for assessing the changed requirements in Mat 05 Resilient construction and Hea 09 Humidity protection in buildings.
- As climate impact covers a wide field, consideration could be given to awarding points for combinations of criteria from several issues, as in BREEAM International 2016 under Wst 05 Adaptation to climate change.
- Climate risk analysis: The Dutch manual provides good principles for the assessment under the issue Mat 05.

Areas which should be kept as they are

- None identified

11 BREEAM-NOR in the building process

This is a summary of all comments, inputs and suggestions received concerning BREEAM-NOR in the building process.

11.1 Feedback from the input phase– building process in BREEAM

In spring and autumn 2020, the Norwegian Green Building Council held numerous meetings to gather input for the new manual. There were two main questions:

- What is working well or not so well in the current manual?
- What are your wishes for the new manual?

More than 500 persons took part, and a large number of useful inputs were received, though for practical reasons, not all of them can be mentioned below. The following are some of the most important feedback responses, broken down by chapter issues.

Issue	Input
Phase 1: Needs analysis	Ordering entities feel that BREEAM offers a wide range of different environmental characteristics to choose between, depending on their ambitions for a certification level. They also feel that BREEAM projects are well structured, so that favourable characteristics are integrated at an early stage. Communication with suppliers becomes easier.
	Requires an overview of best practice in process management. And how to use BREEAM in competitive tenders. A matter for mutual discussion. For example, including the preliminary analysis as part of the tender documents.
	In reality, bidders seem to be competing to supply good solutions. The industry has become more mature. Knowledge and interest are higher. Things are clearer. Makes them even clearer/inevitable.
	Project managers are problem-oriented with a focus on budget and progress. Therefore they are the most sceptical about BREEAM processes. The other players are more positive about BREEAM.
	Project managers feel that BREEAM works well in the tendering situation.
	A few would like to see more project managers with BREEAM AP training.
	Some project managers feel that BREEAM ought to cooperate with Interaxo and other project management tools.
Phases 2 and 3: Concept development and concept	Project designers feel that the clear environmental requirements in BREEAM are a good thing. They also report that BREEAM is being assessed at a general level in this phase, because most of the requirements are very detailed and

Issue	Input
processing	unsuitable for assessment in the early phases. Project designers would like to see a greater number of specific environmental assessments being included in early phases in the manual.
	Clarification of expectations between the ordering entity and the project designers should be carried out early in the BREEAM process.
	Project managers say that they have moved away from environmental monitoring plans in favour of BREEAM. BREEAM is more binding and it is harder to make deviations.
Phase 4: Detail design	Project designers feel that the serious work with BREEAM starts in the detail design project. This makes things difficult, as they feel this is far too late.
	Some project managers feel that the BREEAM process is often a side process in the project, with BREEAM APs being invited to selected meetings. A successful process can be achieved if the BREEAM AP is part of the project design management group. This leads to quicker decisions on an improved basis.
	Some project managers would like to see BREEAM APs being less interested in trade issues and more in the process.
	The individual project managers feel that the ordering entities do not realise the consequences of their own order until the detail design project. This can lead to some credits being lost.
	Project managers and ordering entities feel that it makes things difficult when APs and assessors interpret the manual differently. It disturbs the predictability of the project.
	All players would like to see digitalisation of the BREEAM documentation.
Phase 5: Production	Some contractors and project designers feel that phase breakdown can be slightly unclear in this phase. Some parts of the project could be in the building phase, while others are still at the detail design level. BREEAM should make allowance for this.
	Project managers do not feel they perceive any difference in the BREEAM process among the different contract forms. Some project designers and ordering entities feel the opposite. In particular, they mention turnkey contracts as more challenging.
	A few project managers feel it can be difficult to influence the actions taken when the BREEAM AP is based at the contractor's.
	Some ordering entities feel that it can be difficult if the AP from the project design phase is replaced by the contractor's AP. It would be better to have the same AP throughout the whole process in order to prevent any loss of information.
	Ordering entities feel they experience fewer errors in the production phase in BREEAM projects, compared with normal practice.

Issue	Input
	Some contractors feel that BREEAM helps them keep focus and make a little more effort. Others mention that the process is improved, giving better quality in the project.
Phase 6: Handover	Some ordering entities feel that the time lag between the finished building and the certificate is too long.
	Project managers and ordering entities feel that BREEAM projects entail higher process costs generally (excluding costs for AP and assessor), resulting in higher construction costs.
	Most players feel that Pass, Good and, to an extent, Very Good are easy to achieve without extra costs or special measures in the project. This is not the case for Excellent and Outstanding projects.
	Project managers experience fewer subsequent complaints.
	Ordering entities feel that external control leads to better quality in the projects.
	Some project managers feel that BREEAM documentation should be better coordinated with MOM documentation.

11.2 Conclusion

Most important findings and demands for change:

- Generally, most agree that BREEAM makes it easier to order, check and supply environmental characteristics in the building. Some feel that the documentation process is too wide-ranging and would like a greater degree of digitalisation.
- Many feel that BREEAM should ensure environmental assessments at an early phase in order to secure better control over deliveries and costs.
- Some inputs stress that the BREEAM AP must be located centrally in the project design phase in order to avoid BREEAM becoming a parallel process. If possible, it would be an advantage for project managers to have undergone the BREEAM AP course. It would also be desirable for the same AP to follow through the whole project, maintaining a focus on the process rather than on the individual trade.
- Several respondents pointed out that APs and assessors interpret the manual differently, creating uncertainty in the project.
- Most agree that BREEAM encourages greater focus on quality and a tidier process, resulting in fewer errors on the building site and fewer subsequent complaints.

Areas which should be kept as they are

- External control of selected solutions and documentation gives greater credibility and higher motivation to make a little bit more effort.