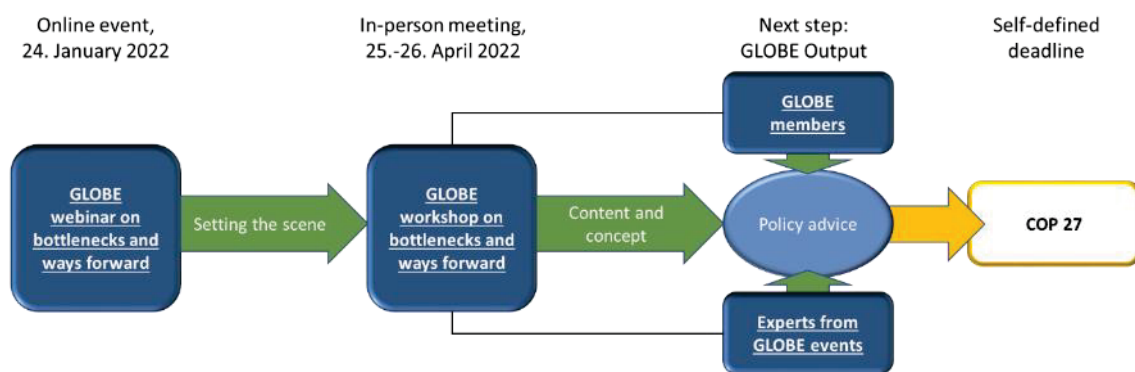


Summary of the GLOBE Consensus Workshop in Lausanne, Switzerland from 25 to 26 April 2022

Lausanne Workshop in a nutshell

During April 25-26, 2022, the Joint Committee on the GLOBE Consensus (JCGC) invited to participate in an in-person workshop at the École Polytechnique de Lausanne (EPFL) in Switzerland. The event addressing high level decision makers and change drivers towards sustainability in the built environment was established as a follow-up event on a virtual kick-off meeting that took place on January 24, 2022, which was supposed to set the scenery and find attendees and relevant questions to be discussed in the workshop at EPFL.

The overall objective of the workshop was to collect opinions, input and discussion topics for a GLOBE Consensus Policy Note, which is aimed to be published before the UN Climate Change Conference 2022 (UNFCCC COP 27) in November 2022.



Flow chart towards the intended policy advice document before the COP 27

The event was hosted by Prof. Karen Scrivener and her group at the École Polytechnique de Lausanne (EPFL) and organized together with the chair of the JCGC Prof. Michael Havbro Faber and Dr.-Dipl.-Ing. Wolfram Schmidt. It was attended by approx. 30 international delegates from a wide range of materials and construction businesses as well as experts from the associations involved in GLOBE.

This report is an unfiltered summary of the workshop. It is not a consolidated conclusion among the group and does not represent the opinions of the authors of the report. The discussions and aspects raised in the workshop and listed up here are not inevitably equal to the projected first GLOBE policy note, which will be short, precise, and very specific. The content of this report beyond the policy note will be used as basis for future activities within GLOBE.

Background

The GLOBE - Global Consensus on Sustainability in the Built Environment has been formed as an initiative of a variety of world-wide associations, which have great impact on the built environment:

- fib – The International Federation for Structural Concrete
- IABSE – International Association for Bridge and Structural Engineering
- RILEM – Intl. Union of Laboratories and Experts in Construction Materials, Systems and Structures
- CEB – International Council for Research and Innovation in Building and Construction
- ECCS – European Convention for Constructional Steel Work
- IASS - International Association for Shell and Spatial Structures

With these associations, the GLOBE Consensus can provide most likely the most experienced and biggest expert network in the world. With this network, the objective is to develop policy advise and information to the public that aims at being free from dogmatic approaches, and as best as possible based on scientific data.



Workshop group after lunchbreak

The overall workshop structure consisted of four major modules:

- First, on Monday morning, a series of input talks was given to provide a wide range of perspectives about sustainable construction challenges and solutions. Since the group of delegates represented a broad range of expertise, the main objective was to share viewpoints and reflections on specific knowledge within the entire workshop group prior to engaging in the following workshop discussions.
- Secondly, on Monday after lunch, in a variety of interactive workshops, relevant topics were addressed and discussed with the group of participants. In order to increase the interactivity and participation, two workshops were held in World Café format and one workshop was organized as a single group brainstorming workshop. The overarching topics of the three workshops were:
 - World Café 1: Low carbon solutions and processes and respective ontology
 - World Café 2: Bottlenecks and ways to overcome
 - Brainstorming: Motivation and mindset change
- Thirdly, on Tuesday morning the group workshop results were presented to the whole group of delegates, giving all attendees the opportunity to learn from each workshop and to add additional aspects and discussion points.
- Eventually, on Tuesday after lunch, the way forward was discussed.

Overview of input talks

Detailed programme and speakers in the input talk session (Monday 9:00-12:45)

- Michael Faber (AAU): Brief introduction, housekeeping and Introduction to Globe consensus
- Nora Steurer and Jonathan Duwyn (UNEP/GlobalABC): Role and ambitions of the UNEP Global ABC (recorded)
- Karen Scrivener (EPFL): Materials perspectives on CO₂ in construction
- Carlos Del Castillo (ECCS): Bottlenecks in implementing more sustainable technologies in steel
- Jochen Koehler (NTNU): Timber in construction
- Will Arnold (IStructE): Perspective of UK Institute of Structural Engineers
- Cyrille Dunant (Univ. of Cambridge): Simple design tools to reduce CO₂
- Vanderley John (USP): Intl. environmental benchmarks for cement, concrete, and structures
- Wolfram Schmidt (BAM): The role of standards in supporting sustainable leapfrog technology - focus on Africa
- Cor Luiten (Municipality of Rotterdam): Building Value Model and Verification
- Bruno Paul Dauphin (Vinci): Vinci strategy to reduce CO₂ in construction
- Jens Christoffersen (Cowi): Cowi perspective on sustainable construction
- Pheladi Tlhatlha (BAM): Introduction to workshops



Michael Havbro Faber (fib, RILEM)



Karen Scrivener (RILEM)



Wolfram Schmidt (RILEM, fib)



Vanderley John (USP) and audience



Audience



Carlos Del Castillo (ECCS)

Overview of workshops

Overview of workshops					
	World Café 1		World Café 2		Brainstorming Workshop
Topic	Low carbon solutions and processes and respective ontology		Bottlenecks and ways to overcome		Motivation and mindset change
14:00-15:30	Mid- to long term technology solutions and low hanging fruits	How to integrate low carbon into real-life processes?	Bottlenecks in the overall framework (politics, policies, finances, society)	Regional aspects, other specific limitations or boundary conditions	How to spark mindset change within the overall framework? <ul style="list-style-type: none"> • Psychology, influencers, change drivers • Incentives, motivation, taxes • Policy level and steering tools
15:30-16:00	Coffee break				
16:00-17:00	How technologies are mutually connected (<i>both tables merged</i>)		Path forward (<i>both tables merged</i>)		Education, training and public communication requirements
17:00	Closure of the workshop				



World Café workshop 1



David Fernandez-Ordenez (fib)



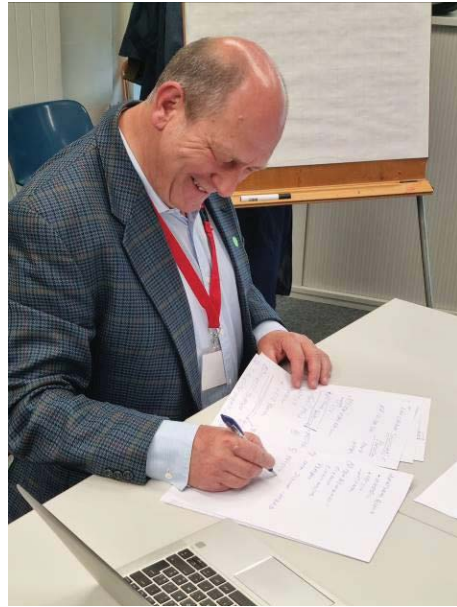
World Café workshop 2



Randi Christiansen (COWI) and Don Ward (CIB)



Brainstorming workshop



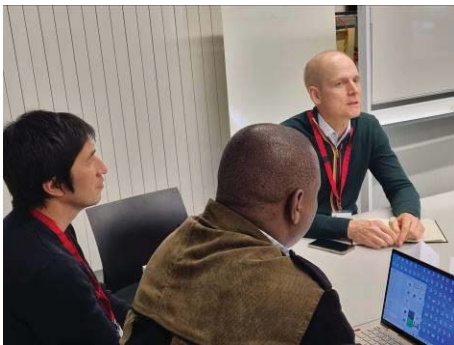
Johan Vyncke (BBRI/RILEM)



Don Ward (CIB)



Christophe Berset (HOLCIM), David Fernandez Ordonez (fib), Thomas Matschei (RWTH)



Roger Ridsdill Smith in workshop 2



Giovanni Plizzari (UNIBS), Cor Luiten (Municipality of Rotterdam), Hu Junmei (EPFL)



World Café 2



World Café 2

Major conclusions

Besides a high number of specific conclusions that need to be drawn and addressed in the Policy Note, based on the workshop results, some major conclusions could be drawn:

- Since no one-fit-all solution can be identified, sustainable solutions need to consider regional specifications, yet have to be coordinated, discussed and empowered on a global scale.
- Data, and best practice solutions need to be accessible, which can be in conflict with business models.
- As climate actions need to be taken immediately, it is relevant to identify where and how the greatest leverage can be achieved. While no region can be ignored, a certain focus has to be put on emerging markets and developing economies (such as most regions in Africa), because the major construction demand is just on the verge to kick-off and the degrees of freedom to implement novel approaches are greater than elsewhere in the world. In return these potentials are limited by lack of funding. Therefore, a global effort and information transfer is required to find best regional and knowledge-based solutions within each specific boundary condition.
- For the objective to highlight ways forward that can achieve positive climate effects on global scale it is important to focus on the big numbers. Therefore, for this very first policy note that is aimed at, certain emphasis will be put on cement and concrete due to the great global demand and the tremendous climate effect and leverage. This does not exclude future similar activities on specific construction technologies, designs and other materials
- The information obtained in the workshop is by far more than the targeted policy note and must be used for further activities.
- Great consensus was found on the fact that meetings like the Lausanne workshop are urgently required and follow up activities would be important. While online events can be a solution for future communication, in-person meetings will be required occasionally as well.

Next steps

Following the workshop, Karen Scrivener, Wolfram Schmidt, Michael Havbro Faber and Will Arnold will develop a pertinent structure for the policy note, which is the major output document from the workshop. The workshop contributions will directly influence the content of the policy note.

Regular online meetings have been scheduled to effectively write the document. Once an elaborate draft of the policy note has been developed, it will be shared with all participants and further reviewers of the associations involved in GLOBE for review, comments, and revision.

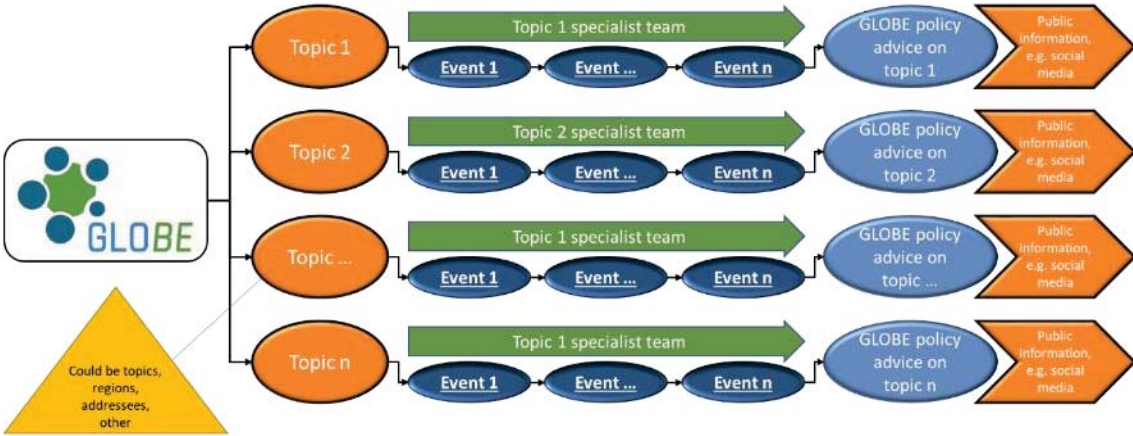
The objective is to have the policy note ready in due time before the COP 27. In parallel, the involved participants will identify and develop paths to access the COP 27 and bring the document to the relevant addressees.

Outlook

As during the workshop a wide variety of relevant topics was identified as urgent but not relevant for the actual policy note, it was getting clear that many more events of similar nature are required to fill the ambitious aims of GLOBE with actions and output.

The Lausanne workshop in combination with the former online workshop pointed out to be very efficient in collecting the relevant players and information. Thus, its evolution can be a role model for

future events, which could be organized by various teams on a wide range of topics, relevant for GLOBE.



Possible paths to create policy advice and public information content within GLOBE

Diversity was identified to be important in the discussion in order to identify the needs but also to spread information and best practices. Particularly GLOBE needs to aim stronger at the involvement of more participants from the global South, more female participants and a wide range of age and hierarchy levels. Concepts to achieve this objective will be worked out in the future.

The discussion in the present workshop was sometimes too Euro-centric and neglecting the challenges of other regions in the world. As this is not the aim of GLOBE, in order to reach out to further regions in the world, regional satellite events will be organised in the future.

Summary descriptions of the Input talks:

Michael Havbro Faber (Aalborg University) introduced into the history and objectives of the GLOBE Consensus. The aim is to develop relevant information to policy makers and the broad public to raise awareness and help making the right decisions towards a more sustainable built environment. The unique item of GLOBE are the associations and the respective global highest level expert network behind them that can contribute to the development of policy advice and information to the public that is free from dogmatic approaches, and as best as possible based on scientific data.

Nora Steurer and Jonathan Duwyn (GlobalABC) highlighted that the most relevant parameters to look at to make the built environment more sustainable are operation, materials, and adaptation to climate change. Whereas adaptation seems to be the most crucial future parameter, the embodied carbon requires more attention, since quite some progress has already been made on operational energy demand in the built environment. Challenges arise from incentivizing old technologies, bias and fear of cost, as well as the fragmentation of the key stakeholders, the most relevant of which for change could be standardization and finance ministries to implement changes.

Franco Zunino and Karen Scrivener (EPFL) underpinned the importance of looking at the big numbers. It is of major importance to look at where the emissions really come from, and in the built environment cement is the greatest carbon emitter but at the same time inevitable for future construction and the greatest leverage to achieve rapid success in reducing carbon emissions. In order to implement efficient changes, it is important to look at those regions, where the major construction is about to take place in the near future, and here, particularly Africa is critical and most promising to implement novel technologies.

Carlos del Castillo (ECCS) reported about the challenges that can be faced related to policy and mindset changes that are urgently required. The carbon footprint of the steel industry is highly linked to the primary energy demand as well as the implementation of circularity. Policy and taxonomy approaches as well as national standards have been developed or drafted towards more sustainability but the greatest challenge is that most regulations continue to look at safety with higher priority than sustainability. Solutions in the steel industry can be found in recycled and green steel as well as in engineering and lightweight solutions.

Jochen Köhler (NTNU) presented about sustainability aspects of construction with wood based materials. He reported that the material has stepped out of its shadowy existence behind concrete and steel and due to industrialization has gained significant relevance compared to more energy intensive building materials. When produced from sustainable sources and with sustainable processes, timber construction can be of low embedded energy and carbon, and today, timber also qualifies for structurally more demanding buildings. A great potential is the reuse and recycling of timber, which requires adapted standards.

Will Arnold (IStructE) showed how data can support enabling a low carbon culture in civil engineering. The challenge is finding a balance between safety and sustainability. In order to facilitate lower carbon emissions, guidance and standards are required based on a robust methodology, sound data, and a software that helps making decisions. These tools can enable highly efficient and resource saving design when combined with training and mutual exchange and learning within a wider community.

Cyrille Dunant (UK FIRES) reported about simple design tools to help project planners reducing the carbon footprint. Within the planning of construction projects a variety of decision makers are involved that follow different philosophies and psychologies that do not typically harmonise. For example, architects have to question their design wishes, when the carbon footprint is too high, but

this requires information and consciousness about the problem at early stage. Digital tools that provide the relevant information at an early stage are thus the key for sustainable decision making, and early decision making is crucial for the implementation.

Vanderley John (USP) reported about the importance of benchmarking. Creating a baseline is relevant for decision making. Different materials and technologies have different carbon emissions depending on technical parameters. These data need to be available and implemented in design software. The data needs to be exchanged to create a positive impact. Brazil has recently developed such a data base which will be launched coincidentally the day after the GLOBE workshop.

Wolfram Schmidt (BAM) pitched in for **Alex Dodoo** (GSA), who had to cancel his attendance on short notice, due to governmental issues. He reported that standardisation institutes in Africa have more societal and political influence than in North America or Europe, which gives them a pivotal role in bringing sustainable technologies into practice. The current level of “under-standardisation” that occurs in most African countries, can, thus, be considered as huge potential to implement sustainable innovation. Most importantly cement standards need to be adapted to the local requirements and cancel historical obstacles, whereas performance based future concepts need to be applied. However, standardization bodies to date are not having mandates to become change drivers, even though changes are required given the fact that Africa can become green global pioneer with the lowest per capita carbon emissions and the most rapid urban development in the world.

Cor Luiten (City of Rotterdam) introduced into the Building Value Model and Verification that is being applied by the city of Rotterdam in order to deal with the complexity the built environment brings, involving a huge number of parameters that are all mutually connected such as technology, functionality, users, assets and reuse of structures. The Model provides an ontology for the complex matters that appear in built environment related processes and helps to identify a set of best choices based on integrated system activity.

Bruno Paul Dauphin (Vinci) highlighted that despite discussion about the high impact of concrete on the global climate, there is no way to build without concrete from the perspective of a construction company. Since established materials, like fly ash and particularly slag, are running out, the industry has to go through a transformation process. This requires an urgent mindset change of everyone involved, but despite the fact that the industry has to inevitably ensure price competitiveness, green washing has to be avoided.

Jens Christoffersen (Cowi) provided some relevant numbers. The built environment makes out 13% of the world-wide gross domestic product share, but at the same time is responsible for 25% of the carbon emissions while the productivity rate remains very low with only 1%. Operational emissions are by far the highest, but these are followed by materials, whereas financing, construction and upgrade emissions are negligible. In order to develop more sustainable holistic processes, urgent innovation and changes are required. Improving the process during the early phase is key.

Pheladi Tlhatlha (BAM) introduced into the workshops that followed the input talks. The World Café format which allows to swap tables was chosen on purpose to catch as many and as diverse opinions from large parts of the delegates. The volunteers to chair workshop sessions were **Will Arnold, Johan Vyncke, Vanderley John, Anne Dekeukelaere, and Carlos del Castillo**.

Summary description of workshop results:

Workshop 1: Low carbon solutions and processes was presented by **Will Arnold** and **Johan Vyncke**.

At two different tables technological solutions and low hanging fruits were discussed as well as ways to integrate low carbon solutions and processes. Eventually, it was discussed, how these technologies and processes mutually influence.

The vision statement of the workshop group was that one day the fragmented linear processes taking place in construction change towards integrated processes, where communication and interaction guarantee efficiency and reasonable decision making.

Enablers of such change were identified to be limits for embodied carbon, reliable carbon calculation standards, and low carbon materials specification. In these aspects it is important to find tailored approaches depending upon the region and other boundary conditions, and to make knowledge available for sharing of best practices. However, the proposed solutions will not reach out to informal construction businesses, which however, dominate in many countries of the global South.

Identified ways towards more sustainable construction were:

- improvements of quality in materials, implementation and design,
- carbon capture, utilization and storage investments,
- design efficiency and reusability as design parameter
- general reuse of existing buildings
- incentives for lower carbon materials production.

Holistic and locally applicable solutions are mandatory for all solutions.

Eventually, low hanging fruits were discussed and classified in three categories:

- encouraging policies, which allow for a wider, more diverse and tailored application
- carbon calculators, which should be based on commonly agreed upon data and free to use,
- the assessment of code and standard changes, which would allow for performance based design and lower design loadings in the limit state of serviceability.

More allowance for performance-based design (testing/advanced analysis)

Workshop 2: The bottlenecks and possible solutions was presented by **Pheladi Tlhatlha**. Bottlenecks in implementing more sustainable technologies were classified between:

- Technical bottlenecks
- Regulatory bottlenecks
- Perception bottlenecks
- Business model bottlenecks
- Measurement bottlenecks, and
- Financial bottlenecks

Technological bottlenecks could be found in often contradictory objectives for structural designers; e.g. reduced cross sections may reduce reliability and safety. Also, materials aspects were discussed such as the reduced workability and standards limitation when cement is reduced in concrete. Furthermore, on construction materials, a downscale to adapt to alternative technologies and resources is often financially not viable. Other parameters, such as informality of business, lack of resources and lack of logistics were identified as regional specific influencing factors.

In terms of regulation, bottlenecks were found in frequently observed inadequate political priorities. Procurement has a major impact but lacks aspects of sustainability. Furthermore, very often the lack of accountability is a major obstacle. In addition, many standards and building codes were not developed with sustainability in mind and often they are too limited in validity for a global scale. The solutions to overcome these challenges are more flexible, adoptable and performance based standards, more transparency in tenders and application of shadow cost indicators.

Perception bottlenecks were mostly found in conservative experts, application of apparently superior standards, which were not made for the region where they apply, in lack of knowledge along the whole chain, and lack of will to change. In order to change perception, pilots are required, that showcase technologies and values that sustainable technologies can bring. Focus in development should be put on scalable technologies.

Business model bottlenecks were identified in the lack of incentives to produce carbon emission figures and the lack of reward of sustainable designs. A specific challenge was found in the fact that structural designers are often paid according to project volume, whereas the client often does not provide capacity to judge the project from a sustainability perspective. Changes towards customer driven supply chains and a good and open communication of best practices can be significant parts of a solution. A challenge to sort out is that more information driven communication and decision making typically comes along with higher costs, which is difficult to implement within the highly competitive construction business, where on top revenues are small compared to the turnovers.

In addition, bottlenecks in reference values or measurements were identified. To date benchmarks, and offset values hardly exist, neither globally nor nationally or regionally. A transparent and accessible data base could become a relevant parameter to enhance the assessment of sustainable designs and structures in the future. However, this has to be budgeted in national and global action plans.

The lack of finances for sustainable design was identified as the major financial bottleneck. This will particularly become a problem in countries of the global north where the affordability of housing is a challenge in general, not to mention sustainable housing. Therefore, the basic needs for housing need to be satisfied with priority, while “a carrot” needs to be provided to reward a shift towards sustainable housing. On a global scale much more funds need to be provided to develop sustainable technologies in the global South.

Workshop 3: Motivation and mindset change was presented by **Carlos del Castillo**. In the discussion it was identified that there is a wide range of influencers, but that at the same time the change drivers cannot always access them adequately.

In order to achieve a mindset change, communication must take place in the language that is required. Too technical details or scientific vanity are not required when reaching out to policy makers, but it is important to keep communication focused on the fundamental principles instead of complex matters. Since technological solutions cannot be entirely objectively judged, it is important to find ways to quickly identify the poor and mediocre solutions, while too much detail in the judgement of equally good solutions can be counterproductive in the sense of “Best is the enemy of the good”, or “Better approximately right than exactly wrong”. A good way to step forward is to minimize complexity and identify just a low number (e.g. 5) decision making criteria for a project or problem, as long check lists contain a too high number of useless criteria. However, the low number of criteria has to be specific.

Rules for circularity are difficult to install, even though the basic principles are known and well understood. In any way, hybrid construction technologies need to be better communicated to the relevant influencers. These have to be identified, mentioned, clearly addressed and encouraged to take responsibility. The GLOBE consensus therefore needs to identify ways how GLOBE can serve to the needs of its target groups.

Possible, relevant groups of people to reach out were identified as the broad public, the industry, the youth (which includes children, as these can influence their parents), ourselves. To motivate people to act more sustainably and to develop circular processes, it is required to find forms of incentives and tax relaxations. Technically the focus should be put more on circularity, materials consumption and structural design and less on primary energy demand, which today is already well implemented and incentivised.

Rules for competitors (e.g. on environmental costs or procurement) have to be clearly introduced by administrations. Early adopters have to be motivated by the actions to step out of individual thinking bubbles and to understand the full supply chains in the entire context.

This way, everyone can act, and already start today by cooperating and influencing the people and stakeholder groups within their direct range. This should ideally not happen anonymously.

It is required for an individual and also for a group (like GLOBE) to reach out within the accessible network and use the network in return to reach out to inaccessible persons and influencers. The GLOBE network needs to develop a map of ways to address stakeholders target oriented and in specific language. Within the workshop group this exercise was made, and it was found that a network can support better external communication. It was identified that important impact can be made within the science, the tech community and the industry, but target groups that need to be reached but are out of reach are children, green tech companies, the overall supply chains, as well as black swans.

For communication and further development of GLOBE, it is important to connect people and disciplines and make use of professional consultants that are experienced in interdisciplinary communication and change management.

Solutions proposed by the delegates

At the end of the workshop all delegates were asked for a short and rapid, clear statement about how sustainable technologies can be brought forwards directly. These could be clustered in aspects related to:

- Standards and policy
- Knowledge, education and mindset
- Technology

Clustered summary of proposed requirements to step forward to bring more sustainability in the built environment
Standards and policy related
<ul style="list-style-type: none">• Performance based standards• Mindset change in standards• Benchmarks and baseline for embodied carbon• Considering the populace as the client• Transparency in decision making• Open source data• Incentives for climate friendly construction
Knowledge, education and mindset related
<ul style="list-style-type: none">• Education for conscious engineering• Awareness of the specific challenges of the global South• Use of local and regional knowledge• Breaking discipline's thinking bubbles• Alignment of decision makers and decision making processes• Different thinking approaches• Consideration of the local context• Awareness of customers• Increase the diversity in processes in the built environment, including women and youth
Technology related
<ul style="list-style-type: none">• Design that takes the embodied carbon into account• Use of bio-based materials• Technology advancements and information technology to optimize the resource efficiency• Holistic structural design processes•