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Think outside the European box: Identifying sustainability competencies for a base of the pyramid context

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Abstract

The complex and global nature of unsustainability requires concerted efforts of sustainability change agents from developed and developing countries all over the world. Various attempts have been made to define competencies needed for change agents to effectively contribute to sustainable development. However, most of the studies on sustainability competencies are Eurocentric in focus. Therefore, it is unclear if a base of the pyramid context would require a different set of competencies. This context is characterized by low per capita income, limited infrastructure, and rural population. To fill this gap, we conducted a Delphi study in two rounds in Ethiopia, as a country at the base of the pyramid. Experts (n = 33) from academia and the industry rated and confirmed seven competencies from the literature as being generally important for sustainable development. Additionally, they identified eight sustainability y competencies specifically important for the Ethiopian context, and thus potentially for other countries with the features of base of the pyramid context. Systems thinking and transdisciplinary competence gained the highest ratings. A subsequent specific literature search revealed that previous studies in contexts other than the base of the pyramid context also identified some of the eight additional sustainability competencies. This is important for future studies regarding the universal nature of certain sustainability competencies. The study brought together three fields of research: sustainability, competence, and base of the pyramid context. Our findings contribute to the theory of professional competence by showing that certain sustainability competencies can be of generic nature, independent of socioeconomic context, whereas others are context-specific. In addition, the sustainability competencies may serve as intended learning outcomes of education and training and development programs for sustainability.

Key words: sustainable development, sustainability, base of the pyramid, Delphi, sustainability competence, corporate social responsibility

1. Introduction

Major challenges facing humanity include climate change and social problems such as poverty. Various authors (Burns, 2013; Dale and Newman, 2005; Wiek et al., 2011) and international organizations such as the United Nations (United Nations, 2015) recognize the need to deal with these issues.

Fostering competencies of sustainability professionals is recommended as one of the measures to deal with unsustainability. However, studies related to sustainability competencies (SCs) are scarce in base of the pyramid (BoP) contexts. Rieckmann (2012, p. 130) argues "… the often-Eurocentric focus of the discourse on sustainability key competencies should be challenged." Rahdari, Sepasi, and Moradi (2016, p. 352) also identified 'Eurocentrism' as "one of the main challenges in the field of corporate responsibility research". Recently, Sterling, Glasser, Rieckmann, and Warwick (2017, p. 163) found out that "Africa, Latin America, and Asia are almost totally absent in the discourse on sustainability competencies..."

Competence is seen as the integrated knowledge, skills, and attitudes which is required for effective performance. A key dimension of competence is its contextuality. : different contexts may require different competencies (Haan, 2010; Mulder, 2014; 2017). Context is important for sustainability professionals (Heiskanen et al., 2016). Idemudia (2011, p. 4) argues "…different cultural environments do present different challenges for CSR practices." Hence, findings of previous research on identification of relevant SCs in one socioeconomic context may not necessarily be relevant in a different context.

Given the unique socioeconomic features at the BoP, it is not clear whether a similar set of SCs identified by previous studies in non- BoP contexts is relevant in BoP contexts as well. It is also unclear if (or what) other SCs are relevant to the BoP context. There are few studies such as Rieckmann (2012) on SCs that included countries from the Global South. Therefore, we conducted this study to get insights into the unexplored area of competencies for sustainability professionals in a BoP context.

1.1. The study context, Ethiopia

A brief overview of the socioeconomic features of Ethiopia helps to demonstrate the relevance of the sustainability competence topic. According to the World Bank (2018), with more than 100 million people, Ethiopia is the second most populous country in Africa. In recent years, the country registered rapid economic growth. To increase the role of the industry sector, the government is constructing industry parks. Such factors may facilitate further production and economic growth.

While the country needs to sustain production and economic growth, careful handling of energy and resource use is important. Consideration of social and environmental impacts of the economic activities is also equally important. In this regard, sustainability professionals have important roles to play. This is where the significance of equipping such change agents with relevant competencies becomes evident.

We took Ethiopia as a BoP country not with the intention to represent all other BoP environments. Rather, because it has the features of the BoP context and it experiences severe impacts of climate change-induced drought (FDRE, 2011). In addition, the country contributes to sustainability efforts at national and international levels. For instance,

- Ethiopia played a leadership role to unite African nations around common positions for climate negotiations of COP15 in Copenhagen (Endalew and Craft, 2016; Roger and Belliethathan, 2016).
- It also had a significant role in preparing African position for the Paris Agreement (Chin-Yee, 2016).
- In 2016, Ethiopia prepared its second Growth and Transformation Plan. Among the basis for this plan are Sustainable Development Goals of the United Nations (NPC, 2016).

In sections two to six, we present the theoretical framework, methodology, results, discussion and conclusion, and limitations and suggestions for future research.

2. Theoretical framework

2.1. Sustainability

Many authors have discussed difficulty of defining sustainability. Having identified more than 100 definitions, White (2013) suggests that the concept is open for different interpretations. For some, the existence of multiple definitions is a source of confusion (Glavic and Lukman, 2007). For others, it is an advantage "…because they allow for broader agreement..." (Vos, 2007, p. 335). When defining sustainability, it is importance to focus on what needs to be sustained (Costanza and Patten, 1995; Vos, 2007).

Sustainable development implies the need to develop economically, to develop socially, and to develop environmentally. The reason why we need the social and environmental aspects is not to facilitate only economic development (Johnston et al., 2007).

This has implications on how developed and developing countries should balance the three elements. For instance, should BoP contexts prioritize economic growth or environmental protection? Are the two mutually exclusive? For instance, Ngosso (2013) suggests that there are situations in which poor countries should prioritize economic growth while at the same time indicating that prioritizing the environmental aspect can also lead to reduce poverty. There are also arguments that the three elements should be given equal priority (Tomšič et al., 2015). However, we argue that how to prioritize the dimensions should depend on the socioeconomic status of a specific context. For example, based on national priorities.

Looking at sustainability from the perspective of its widely agreed features is also useful to get a better understanding of this concept. Accordingly, sustainability is a comprehensive, future-oriented and intergenerational concept that encompasses and balances economic, social, and ecological aspects of development (Dale and Newman, 2005; Lumley and Armstrong, 2004; Vos, 2007; White, 2013).

Based on its widely agreed elements of different definitions, we define sustainability as "an all-inclusive development intended to sustain relevant human and natural resources required for social, environmental, and economic progress of current and next generations."

In this current study and in other studies (Figueiró and Raufflet, 2015; Lumley and Armstrong, 2004) sustainability and sustainable development are used interchangeably.

2.2. Competence

Approaches to competence can be categorized into behaviorist, generic, and comprehensive (Sturing et al., 2011). The first one which is based on Behaviourist theories is said to be a task-oriented approach. It considers competence as a list of isolated job performance-related behavioral elements which are based on specific job descriptions required to perform a given task. The approach has limitations that it overlooks the importance of context and ignores the significance of synergy.

Following this, a generic approach that considered competence as a general and context-neutral concept and which focused on personal characteristics of performers emerged. Its criticism was that it ignored domain specificity of expertise and undermined the importance of context. Because of limitations of the above two, a comprehensive approach emerged. Rather than focusing on knowledge, skills, and attitudes in isolation, this approach focused on their integration. It also recognizes that competence is situation-dependent (Le Deist and Winterton, 2005; Wesselink et al., 2015). In addition to knowledge, skills, and attitudes, some authors specifically mention values as components of competence. Lambrechts et al. (2013, p. 65) state that "Competences integrate knowledge, skills, values and attitudes..."

In this study, the comprehensive approach and a related definition of the concept competence is used. That is, integration of skills, knowledge, and attitudes to perform a task (Miller, 1990; Shavelson, 2013) and to solve a problem in specific real-life situations (Mulder, 2014; Wiek et al., 2011). Among the important aspects of competence is its relationship with performance. As competence cannot be directly assessed, it is inferred from performance in real life equivalent situations (Shavelson, 2013). Another key feature of competence is that it is context-specific (Mulder, 2014).

2.3. Sustainability competencies

Acquiring certain competencies is required to deal with complex issues in unpredictable environments and to play a role in the effort towards sustainable development (Dale and Newman, 2005; Rieckmann, 2012; Viegas et al., 2016; Wiek et al., 2011). Such competencies contribute in making individuals feel

more responsible and get ready to participate vis-à-vis sustainability (Mochizuki and Bryan, 2015). Sustainability competencies (SCs) are also viewed as 'intended learning outcomes in education for sustainable development...' (Barth, 2016, p. 5). As an example of sustainable development competence, Wals (2014, p. 6) mentions "…citizen's capacities to contribute to sustainable living both professionally and personally..."

Based on the inputs from various sources (Akeel et al., 2019; Molderez and Ceulemans, 2018; Wiek et al., 2011), we define sustainability competence as the integration of knowledge, skills, and attitudes that facilitate efforts to sustain relevant human and natural resources required for social, environmental, and economic progress of current and next generations.

The SCs identified by the experts in this study and the ones taken from the literature are not isolated and independent of each other. Rather, they are related and sometimes complementary (Molderez and Fonseca, 2018; Wiek et al., 2011). Further discussion of how the SCs are relevant to the BoP context under study is given in Section 5.

2.3.1. Identification of sustainability competencies from the literature

As starting points, to identify SCs to be rated by experts, we used the following works for their relevance, methodological variety, and adequate descriptions of the SCs. Osagie, Wesselink, Blok, Lans, and Mulder (2014), undertook a systematic literature review and conducted interviews to identify SCs. Wiek et al. (2011) used a broad (peer-reviewed and grey) literature review and prepared a framework. Roorda (2013, p. 104) identified competencies that 'typify a sustainability competent professional'. Heiskanen et al. (2016, p.218) identified competencies sustainability professionals learn from education in the real world and summarized 'most important competencies of sustainability change agents...' Though they are not exhaustive, we assume that the competencies from these studies include widely recognized SCs. We compared the SCs from the above studies using the terms and descriptions they used for the SCs. In most instances, the aforementioned authors used similar terms. In some cases, names of the SCs were different while the descriptions were essentially similar. The overlap of the SCs is assumed to confirm their importance as the authors of these works used different methods and contexts.

As depicted in Table 1, six SCs overlap in all the four studies. These are generic competencies i.e. they are relevant across different fields (Perez Salgado et al., 2017). We used these and a seventh sustainability competence (SC) i.e. disciplinary / subject-specific competences as starting points. We included 'Disciplinary competences' even though it overlapped only in two of the four studies. This is because it would be an opportunity for the experts to think about subject-specific competencies when suggesting competencies for sustainability.

Table 1

Sustainability competencies from the literature as starting points for round one

	Sources		
(Osagie et al., 2014)	(Wiek et al., 2011)	(Roorda, 2013)	(Heiskanen et al., 2016)
1. Anticipating CSR challenges	Anticipatory competence	Future orientation	Anticipatory competences
2. Understanding CSR-relevant systems and subsystems	Systems-thinking competence	System orientation	Systems-thinking
3. Managing CSR implementation	Strategic competence	Action skills	Action skills
4. CSR leadership competencies	Strategic competence	Future orientation	Strategic competences
5. Interpersonal competencies	Interpersonal competence	Emotional intelligence	Interpersonal competences

6.	Personal value driven competencies	Normative competence	Personal involvement	Normative competence
7.			Disciplinary competences	Subject-specific competences

2.3.2. Sustainability competencies and corporate social responsibility

Corporate social responsibility (CSR) is a business approach to sustainable development. It refers to voluntarily integrating socio-environmental aspects with business activities (van Marrewijk, 2003). Some authors use sustainability and CSR interchangeably (Osagie et al., 2014; Wesselink et al., 2015).

2.3.3. Sustainability competencies and sustainable development goals (SDGs)

In 2015, the United Nations announced 17 SDGs and 169 targets in its Agenda 2030. The SDGs are said to be universal and intended to achieve sustainable development by 2030. Goal 4.7 states, "By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development…" (United Nations, 2015). This goal recognizes that certain competencies are required to facilitate sustainability.

2.4. Base of the pyramid

Base of the pyramid context refers to socioeconomic characteristics, of mainly developing countries, including low income, larger rural population, and limited infrastructure (Goyal et al., 2016; Halme et al., 2015; Prahalad, 2012; Prahalad and Hart, 2002). Based on these features, we define the BoP context as "an environment where a significant proportion of people with low income and limited infrastructure live mainly in rural regions of developing countries."

The BoP context has the unique features mentioned above. These characteristics set it apart from high-income environments. The difference in socioeconomic factors and context-specificity feature of competence motivated our study. Accordingly, we looked at relevance of SCs identified mainly by

Eurocentric studies for a BoP context. Furthermore, we identified additional SCs relevant in the BoP context.

3. Methodology

The major objective of this study was to identify SCs that are relevant for the BoP context. To this effect, we used the Delphi method. The following research questions guided our research:

Research questions

1. Are the sustainability competencies identified in non-BoP contexts relevant in a BoP context?
2. What competencies are relevant for sustainability professionals in a BoP (Ethiopian) context?

3.1. The Delphi method

Sustainability is related to different fields of expertise and related issues are complex. Hence, solutions are expected to come from a concerted effort of various professionals (Friman et al., 2018). We used the Delphi technique because it is a method appropriate for studies that seek a combined wisdom of a group of experts about issues that do not have clear-cut answers (Dalkey, 1969; Hasson et al., 2000). In addition, participants are groups of experts in the area under study and their decisions "have greater validity than those made by an individual" (Osborne et al., 2003, p. 698).

The study is based on the judgements of experts. In this case, the Delphi method is a better choice. This is explained by Rowe and Wright (2001, p. 141) as "… research has shown that Delphi-like groups perform judgmental and forecasting tasks more effectively than other judgmental approaches." The other reason for choosing the Delphi technique is its potential to deal with the influence of dominant participants (Dalkey, 1969; Gupta and Clarke, 1996). In addition, the method enables participants to change their mind i.e. their responses from round to round without fear of other participants' judgement (Ballantyne et al., 2016; Geist, 2010; Rowe and Wright, 2001). As the participants live in different geographical

locations, the Delphi method enabled us to conduct the study without the need for face-to-face interaction of experts (Yousuf, 2007).

However, the Delphi method has some limitations too. These include its continuous modification and lack of proper guidelines (Hasson and Keeney, 2011). The different criteria used by Delphi researchers for selection of experts, determining consensus, and number of experts could be the result of lack of proper guidelines. Awareness about these issues and adequate preparations may help to carefully plan and execute Delphi studies.

The Delphi method has some defining features. These include anonymous group responses, multiple rounds of data collection, and summary of statistical group responses sent to participants after each round (Dalkey, 1969).

3.2. Identification of experts

The quality of Delphi studies depends on, inter alia, appropriateness of participants' qualification (Powell, 2003). Previous Delphi studies used various criteria to select experts. These include expertise in research (Rieckmann, 2012), familiarity with the study context (Caron et al., 2016), and knowledge of the field under study (Day and Bobeva, 2005). Sustainability requires concerted efforts of both practitioners and researchers. Therefore, we included experts from academia and practitioners from the industry. The latter are sustainability professionals in non-governmental organizations (NGOs), governmental organizations, and businesses. The business category included banks, an airline, mixed sector investments (agriculture, mining and industries), and a brewery company. We selected the specific organizations because they are among the few organizations in Ethiopia engaged in sustainability.

3.2.1. Inclusion criteria

For all experts, it was a requirement to have their experience in Ethiopia. An academician should have at least a master's degree and five years of teaching and research experience. The experience should be in accredited higher education institutions and related to sustainability. Moreover, the person should have

either taken or taught a course, published an article or presented a conference paper, participated in negotiations, policy-making, training, or consultancy. A person from the industry should have at least a bachelor's degree and a minimum of three years of experience. The expertise should be in one or more of the areas listed above for academicians.

3.2.2. Expert recruitment strategies

We identified experts from April to December 2016 using different strategies. We contacted sustainability-related radio and television programs hosts to obtain a list of notable potential experts who have been on their shows. In addition, we used conferences, resource persons, websites, and LinkedIn. Diversity of experts is important to generate widely applicable insights (Powell, 2003). Therefore, we first identified diverse experts and then used the snowball method. We did this by asking the experts to recommend more potential experts. Moreover, to secure diverse experts, we used the multiple means of identifying potential experts mentioned above. The combined expertise of these experts covers the three dimensions of sustainability.

3.2.3. Panel size

Delphi studies use different panel sizes depending on availability of resources and other factors (Powell, 2003). The total number of experts identified though the aforementioned means was 85. Next, we met 67 of the potential experts in person and contacted the remaining through the phone. This was an opportunity to explain the purpose of the study, to create rapport, to check which potential experts meet the inclusion criteria, and to get their consent. At this time, participants gave their consent orally. Later, they indicated their consent by checking a box in the questionnaire. Meeting experts prior to data collection helps to increase response rate (Hasson et al., 2000). During this meeting, 30 of the identified people informed the first author that they do not meet the criteria or they cannot participate. Hence, we excluded them. We excluded ten others after checking their expertise vis-à-vis our criteria. Finally, we sent invitation letters to 45 experts who met the criteria and expressed their willingness to participate. The letter informed them about: purpose of the study, the selection criteria, a promise to keep the data anonymous, the estimated time commitment, possibility of a maximum of three rounds, operational definitions of key concepts, a

promise to acknowledge experts, our intention to publish the study, and contact details of the first author. This helps to create rapport, secure commitment of respondents, and increase the response rate (Hasson et al., 2000).

Table 2

Demographic characteristics of experts who participated in both rounds

Education					
Bachelors	Masters	PhD			
3 (9.09%)	17 (51.51%)	13 (39.39%)			
Years of experience					
3-8	9-14	15-20	21-26	27-32	33 or more
5 (15.15%)	8 (24.24%)	8 (24.24%)	4 (12.12%)	7 (21.21%)	1 (3.03%)
Sector					
Academia	Industry				
16	17				
Experts from academia with industry experience					
Yes	No				

12 (75%)	4 (25%)				
			Age		
25-34		35-44	45-54	55-64	Not given
6 (18.18%)		10 (30.30%)	11 (33.33%)	3 (9.09%)	3 (9.09%)

3.3. Definition of consensus

To determine consensus in Delphi studies, various authors have either used or recommended different combinations of measures. These include median, mode, interquartile range (IQR), and percentage of positive or negative responses (Rayens and Hahn, 2000; von der Gracht, 2012). Therefore, in this study we used a combination of the sum of percentages of relevant and very relevant responses, median, and IQR to determine consensus.

3.4. Number of rounds

Initially, we designed our study to have a maximum of three rounds. However, the level of agreement in two rounds suggested that a third round would not be necessary.

For each round, we pilot-tested the instruments and identified outlier responses. In addition, Pearson's chi-square test was conducted. This was to see whether there is a statistically significant ($p < 0.05$) difference between responses of experts from academia and those from the industry. The questionnaires included open-ended and closed-ended items. Therefore, we used qualitative and quantitative data analysis methods. We elaborated these in their respective sections.

3.5. Round one instrument preparation, data collection, and analysis

3.5.1. Round one instrument preparation

We prepared the closed-ended items based on the studies used as starting points (see Table 1). In six of the seven SCs presented for rating, we used the descriptions (or parts thereof) given by their respective authors (See Table 6). Inputs from the pilot test about the need for more clarity led to modification of the description for the 'disciplinary competence' given by the author.

The first round instrument comprised a combination of closed-ended and open-ended questions, instructions about how to complete the questionnaire, and operational definitions of key concepts. We presented the seven SCs and their descriptions identified from the literature to be rated by the experts. The rating used a 5-point Likert scale where 1 indicated 'very irrelevant' and 5 indicated 'very relevant'. Pilot testing in a Delphi study is suggested 'to enhance authenticity' (Keeney et al., 2006), to improve methodological rigor (Hasson and Keeney, 2011), and to check clarity of the questionnaire (Powell, 2003). For round one, three potential experts with the required expertise participated in the pilot testing. Based on their comments and inputs from coauthors, we improved the draft questionnaire. We finalized the questionnaire as a two pages document on Microsoft Word.

3.5.2. Round one data collection

We administered the questionnaire on February 7, 2017 mainly through emails. We also provided an additional option of hard copy versions. Delphi studies usually suffer from low response rates (Christie and Barela, 2005; Meijering et al., 2015). Therefore, we used follow-up mechanisms to remind experts. We received the last completed questionnaire on March 1, 2017. Out of the invited 45 experts, 36 completed and returned the questionnaires i.e. a response rate of 80%.

3.5.3. Round one data analysis

In round one, we calculated frequency, percentage, median, mode, and IQR for all experts' ratings of each of the seven SCs. The consensus criteria in this round are a combined result of three measures. These are, 'relevant'(R) plus 'very relevant' (VR) responses greater than or equal to 80%, IQR of 1 or less, and median values of 4 (relevant) or 5 (very relevant).

3.6. *Round two instrument preparation, data collection, and analysis*

3.6.1. Round two instrument preparation

We developed round two questionnaires based on the additional SCs suggested by participants in round one. From the 36 experts who participated in the first round, 28 suggested additional SCs. We compiled these texts verbatim. The generated data is of a manageable size and we did data analysis (content analysis) by hand. We analyzed the data using the 5 steps process by Taylor-Powell and Renner (2003). This involved repeatedly reading the text, focusing the analysis vis-à-vis the purpose of our study, organizing the data, breaking down texts into themes, and identifying connections within and among categories. At the end of these steps, 11 categories (i.e. SCs) emerged.

Following this, we prepared descriptions to represent the 11 newly emerged categories. Experts suggested names for some of the categories. The remaining categories were named by the authors.

The first author completed the above five-step process. Next, the other coauthors reviewed and commented on the newly identified SCs and their descriptions. Accordingly, we improved the categories and their descriptions. As was the case in round one, we conducted pilot testing in round two with three people who fulfill the criteria. They detected redundancy and this led to the merger of two competencies. Information acquiring competence and communication competence became 'communication and information acquiring competence'. The pilot test also helped to improve clarity of the SCs and their descriptions. Following this, we sent invitation letters to round two via email to the 36 experts who participated in round one.

We prepared the questionnaire in a clickable PDF format. It comprised instructions, a promise to anonymously keep responses, demographic questions, the SCs to be rated and their descriptions, and a request for consent of participants. For experts from academia, we included one more question. That is, *"Do you have sustainability related experience in the industry i.e. outside the higher education environment (e.g. consultancy or training, project development, implementation, or other services to government, NGOs or business organizations)?"* This was to see how many of these experts have sustainability experience in the industry, in addition to their experience in academia. Twelve (i.e. 75%) of the 16 experts from academia who participated in both rounds have experience both in the industry and in academia. All of these 16 experts are currently active in teaching and research. Actually, two of them

have been promoted to the rank of Full Professorship during the course of this study. Table 2 depicts details of demographic characteristics of the participants.

3.6.2. Round two data collection

On May 25, 2017, we distributed round two questionnaires by email among the 36 experts. We also sent a summary of the quantitative analysis of the first round, and the newly emerged SCs with their descriptions. This was to make sure that inputs of the experts were duly accounted for and to create a common understanding regarding the SCs that would be rated as round two questionnaire items. This practice helps to ensure construct validity (Hasson and Keeney, 2011; Okoli and Pawlowski, 2004). From the thirty-six experts, 33 completed and returned the questionnaire. This is a response rate of 91.6% and 73.3% from round one and from the total number of potential experts invited before round one respectively. Two of the three experts who dropped out in round two are from academia and one is from the industry. In this round too, we carried out follow up communications and obtained the last completed questionnaire on July 9, 2017.

3.6.3. Round two data analysis

In round two, we expected more agreement because the SCs to be rated would be the suggestions of the experts themselves. Therefore, as consensus criteria, we used the sum of relevant and very relevant responses of greater than or equal to 85%, the same median and IQR values as the ones specified for round one.

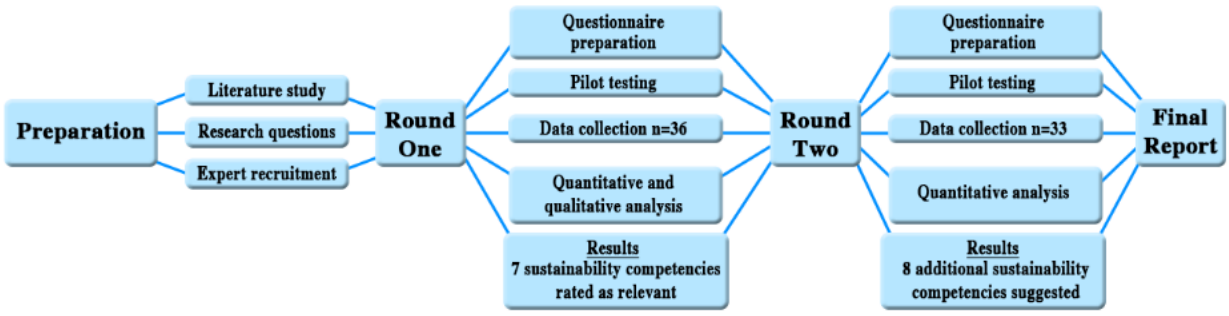

Fig.1. Schematic summary of the Delphi process

4. Results

4.1. Round one results

Table 3

Ranking of SCs by percentage of 'relevant' plus 'very relevant' responses

Rank	All Experts (n=36)	Experts from academia (n=18)	Experts from the industry (n=18)
1	Systems thinking competence (97.2%) 80.6%	Systems thinking competence (100%) 77.8%	Disciplinary competence (100%) 77.8%
2	Disciplinary competence (97.1%) 69.4%	Interpersonal competence (94.5%) 66.7%	Systems thinking competence (94.4%) 83.3%
3	Interpersonal competence	Disciplinary competence	Anticipatory competence

	(94.3%) 66.7%	(94.4%) 61.1%	(94.4%) 72.2%
4	Action competence (94.3%) 52.8%	Action competence (94.4%) 61.1%	Interpersonal competence (94.4%) 66.7%
5	Anticipatory competence (91.6%) 72.2%	Anticipatory competence (88.9%) 72.2%	Action competence (94.4%) 44.4%
6	Strategic competence (88.8%) 61.1%	Strategic competence (88.9%) 55.6%	Strategic competence (88.9%) 66.7%
7	Normative competence (86%) 44.4%	Normative competence (88.9%) 38.9%	Normative competence (83.3%) 50.0%

The three columns in Table 3 are independent of each other. The 'All experts' column depicts ranking of the seven SCs by all the 36 experts; it is not the sum of the next two columns. The 'Experts from academia' column shows ranking of the SCs by calculating only the responses of the 18 experts from academia. The 'Experts from the industry' column represents ranking of the SCs by calculating only the responses of the 18 experts from the industry. Each column shows the percentages of 'very relevant' and 'relevant' responses. For instance, the SC ranked 2nd based on rating by all experts is disciplinary competence; according to experts from academia, it is interpersonal competence; based on rating by experts from the industry, it is systems thinking.

For some of the SCs in Table 3, the percentage of 'relevant' plus 'very relevant' responses (i.e. the figures given within parenthesis) are the same. In such cases, we used percentages of 'very relevant' responses (i.e. the figures given off parenthesis) as additional means of ranking the SCs.

In round one, systems thinking competence got the highest percentages of relevant (R) plus very relevant (VR) ratings i.e. R+VR = 97.2%, VR = 80.6 rating by all experts. This is the only SC with IQR of 0. The remaining six SCs have IQR of 1. All the SCs ratings have median values of 5 except for 'normative competence' which has a median value of 4. All the 7 SCs gained agreement based on the predefined consensus criteria. Therefore, none of them had to be presented in the next round. A Chi-square test in round one showed that there is no statistically significant difference between ratings of the seven SCs by experts from academia and those from the industry.

4.1.1. Outlier responses in round one

In Delphi studies, it is recommended that experts whose rating of an item are outliers provide their reasons for their decisions (von der Gracht, 2012). We defined outliers based on the 1.5 x IQR rule. These are responses significantly different from the aggregate responses of the whole panel. We found ratings of three SCs by two experts to be outliers. We contacted these experts to get their explanation for the ratings. Expert "I27" rated 'normative competence' as 'irrelevant'. He shared his reasons as, *"Unless the necessary administrative systems are put in place, normative competence by itself may not contribute to sustainability. Such systems are now lacking. Therefore, normative competence may not be relevant."* Expert "A15" rated 'strategic competence' and 'action competence' as "very irrelevant". His explanation about strategic competence is, *This competence is relevant only for policy makers, not for all sustainability professionals. Lower level sustainability professionals do not engage in strategic issues. Therefore, they do not need this competence."* The same expert explained why he rated 'action competence' as very irrelevant. He said, "*Action competence is relevant only for practitioners from the industry. Sustainability professionals from academia do not need action competence. Honestly, I did not remember the operational definition of 'sustainability professional'. However, I should have thought about sustainability professionals in the industry."*

4.2. Round two results

Table 4

Ranking of SCs based on percentage of ('relevant' + 'very relevant' responses) and ('very relevant' responses).

Rank	All experts (n=33)	Experts from academia (n=16)	Experts from the industry (n=17)
1	Transdisciplinary competence (100%) 75.8%	Transdisciplinary competence (100%) 81.3%	Flexibility and continuous learning competence (100%) 76.5%
2	Flexibility and continuous learning competence (100%) 72.7%	Communication and information acquiring competence (100%) 81.3%	Stakeholder coordination competence (100%) 76.5%
3	Communication and information acquiring competence (100%) 63.6%	Flexibility and continuous learning competence (100%) 68.8%	Transdisciplinary competence (100%) 70.6%
4	Stakeholder coordination competence	Tolerance competence (100%) 68.8%	Resource utilization competence (100%) 64.7%

	(97%) 78.8%		
5	Resource utilization competence (97%) 72.7%	Resource utilization competence (93.8%) 81.3%	Policy integration and cooperation competence (100%) 64.7%
6	Tolerance competence (97%) 69.7%	Stakeholder coordination competence (93.8%) 81.3%	Social justice and inclusion competence (100%) 52.9%
7	Social justice and inclusion competence (97.%) 63.6%	Social justice and inclusion competence (93.8%) 75.0%	Communication and information acquiring competence (100%) 47.1%
8	Policy integration and cooperation competence (97%) 57.6%	Indigenous competence (93.8%) 68.8%	Tolerance competence (94.1%) 70.6%
9	Competence to balance sustainable development dimensions (90.9%) 60.6%	Competence to balance sustainable development dimensions (93.8%) 62.5%	Competence to balance sustainable development dimensions (88.2%) 58.8%

10	Indigenous competence (90.9%) 60.6%	Policy integration and cooperation competence (93.8%) 50.0%	Indigenous competence (88.2%) 2.9%

Table 4 is also structured in the same way as Table 3. That is, the three columns are independent of each other.

For some of the SCs, the percentage of 'relevant' plus 'very relevant' responses (i.e. the figures given within parenthesis) are the same. In such cases, we used percentages of 'very relevant' responses (i.e. the figures given off parenthesis) as additional means of ranking the SCs.

In this round, transdisciplinary competence got the maximum rating of R+VR i.e. 100% with VR rating of 75.8%. Based on the ratings by all experts, the median and mode relevance of all the ten SCs were 5 (i.e. very relevant). Except for 'stakeholder coordination competence' for which IQR value was 0, the remaining nine SCs had IQR of 1.

To see if experts from academia and the industry would rate the SCs differently, we performed a Chi-square test in the second round as well.

Table 5

Pearson's Chi-square test for communication and information acquiring competence

Panel of Experts	Responses		
	Relevant	Very Relevant	Total
Academia	3	13	16
Industry	9	8	17

Total	12	21	33
Pearson chi2 (1) =	4.1640	Pr = 0.041	

"Communication and information acquiring competence" is the only SC where a statistically significant difference exists between ratings by experts from the two sectors, X2 (1, N = 33) = 4.16, p = .041. Experts from academia rated this competence as median = 5, mode = 5 and IQR = 0. Their counterparts from the industry rated it as median = 4, mode = 4 and IQR = 1.

In the second round too, all the SCs gained consensus. Hence, there was no need to go to a third round as initially planned. This agrees with the suggestion by Keeney et al. (2006) about how long the Delphi process continues. See Table 6 for the updated list and descriptions of all the SCs that gained consensus in in both rounds.

4.2.1. Outlier responses in round two

In the second round, we found two responses by two experts to be outliers. We requested the experts to share their reasons. Expert "B" rated 'indigenous competence' as 'irrelevant'. He based his response on his own understanding of the word 'indigenous'; he did not consider the description of indigenous competence given in the round two questionnaire. Through email communication, he later explained that he would rate the competence favorably if he considered the description of the competence. Expert "C" rated 'Competence to balance sustainable development dimensions' as 'irrelevant'. We requested his explanation and he informed us that it was because of oversight. He requested the first author via email to re-rate the item as 'relevant'. Hence, the rating was changed accordingly. In both rounds, the outlier responses of participants who did not change them after our discussions were kept as they are.

5. Discussion and conclusion

Base of the pyramid context has unique features that set it apart from high-income environments. In addition, studies related to sustainability competencies are predominantly Eurocentric. Hence, it was not

clear whether previous findings are relevant to the BoP context. The study involved participants selected from academia and the industry for having relevant expertise. Analysis of the data shows that in round one the experts confirmed relevance of seven SCs to the BoP context. These are the SCs listed in Table 6 from number one to seven. In addition, the experts identified ten more SCs (see Table 4). After further processing of the ten SCs and merging two pairs of similar ones, the final additional SCs are now eight. These are listed in Table 6 from number eight to fifteen. Names of these and the seven SCs from the literature have also been modified to better reflect their essence and to show their relevance to sustainability.

Table 6

Sustainability competencies relevant to the BoP context

No	Sustainability competencies	Descriptions
1	*Systems thinking competence to understand complex sustainability issues*	"…ability to collectively analyze complex systems across different domains (society, environment, economy, etc.) and across different scales (local to global) …"(Wiek et al., 2011, p. 207)
2	*Disciplinary competence in sustainability-related fields*	In addition to generic competencies, a sustainable development professional should have competence in his/her specific field. (Roorda, 2013)
3	*Interpersonal competence to facilitate collaboration of sustainability stakeholders*	"…ability to motivate, enable, and facilitate collaborative and participatory sustainability research and problem solving." (Wiek et al., 2011, p. 211)
4	*Action competence for*	Decisiveness and capability to act (Roorda, 2013)

	sustainability interventions	
5	*Anticipatory competence to predict future sustainability issues*	Ability to foresee possible sustainability issues to be faced and devise frameworks to deal with them (Roorda, 2013; Wiek et al., 2011; Osagie et al., 2014; Heiskanen et al., 2016)
6	*Strategic competence to devise sustainability interventions*	"…ability to collectively design and implement interventions, transitions, and transformative governance strategies toward sustainability." (Wiek et al., 2011, p. 210)
7	*Normative competence for sustainability goals*	"…ability to collectively map, specify, apply, reconcile, and negotiate sustainability values, principles, goals, and targets." (Wiek et al., 2011, p. 209)
8	*Transdisciplinary competence to collaborate with diverse sustainability experts*	Understanding that sustainability requires collaboration of experts from different fields. This competence includes readiness and skills to work with experts from other disciplines.
9	*Flexibility and continuous learning competence for sustainability*	Realizing that sustainability issues are dynamic and that they require sustainability professionals to constantly update themselves. This includes skills and attitudes to learn timely and relevant knowledge changing situations may demand to flexibly approach each situation.
10	*Communication and information acquiring competence for sustainability*	Knowledge about sustainable development dimensions and readiness to acquire and utilize information about socio-environmental issues. It includes capability to create

		sustainability awareness in the wider population, deal with, learn from, and influence stakeholders towards sustainability.
11	*Stakeholder and policy coordination competence for sustainability*	Ability to organize efforts of various actors including relevant individuals, societies, groups, and experts. It requires readiness, knowledge, and skills to create synergy, learn from each other, tap global cooperation opportunities, and coherently integrate local, national, and international sustainability policies.
12	*Resource utilization competence for sustainability*	Knowledge, skills, and readiness to efficiently allocate and use material resources, enhance analytical and technical skills of workers, and setup institutional arrangements.
13	*Social justice and inclusion competence to promote sustainability*	** Ability and readiness to consider the needs and values of diverse groups (including future generations). It includes skills, attitudes, and knowledge to promote tolerance, equitably distribute resources, listen to each other, and peacefully repair past and current harms.
14	*Competence to balance sustainable development dimensions*	Genuine concern for society and the environment with knowledge and skills to properly balance the three elements of sustainable development. It includes readiness to challenge too much focus only on the economic dimension at the expense of social and environmental sustainability.
15	*Competence to utilize indigenous resources for sustainability*	Appreciating one's own local competence, values, culture, history, language, and the natural environment. The competence includes realizing the potential of local natural and human

	resources and skills to utilize these for sustainable development.

For SCs from number eight to fifteen, either the participants or the authors gave the descriptions. **An expert used the term 'Social justice and inclusion competency' and parts of the description given by Loffredo (2016) accessed from https://www.naspa.org/constituent-groups/posts/the-social-justice-and-inclusion-competency. A similar term and parts of the description are used in this study.

The SCs identified by all experts as most important in round one are systems thinking competence, disciplinary competence, and interpersonal competence. In round two, most experts favorably rated transdisciplinary competence, flexibility and continuous learning competence, and communication and information acquiring competence. We determined the relative importance of all the fifteen SCs based on the sum of percentages of relevant and very relevant ratings. In 14 of the 15 SCs, there is no statistically significant difference between ratings of experts from academia and those from the industry. This could be because most (i.e.75%) of the experts from academia have sustainability-related experience in the industry as well. Hence, they may appreciate the sustainability priorities in the industry somewhat similarly with their counterparts in the industry. The only exception was 'communication and information acquiring competence'. Academicians have attached more importance to this competence. This could be because the competence is related to their job of fostering knowledge, skills, and attitudes of their students. Except 'disciplinary competence', the remaining 14 SCs are generic competencies. Hence, they are relevant across professions. The findings can contribute theoretically to the BoP and SCs discourse by showing which SCs are relevant in this context. In addition, the identified SCs may be used as intended outcomes of education and training programs preparing sustainability change agents. To this end, one possibility could be consideration of these SCs when designing curriculum contents and sustainability trainings.

5.1. Relevance of sustainability competencies in BoP and non-BoP contexts

To get insights into relevance of the SCs across contexts, we used a two-way process. In round one, the experts confirmed relevance of the seven SCs taken from the literature. Specific literature search carried out after experts identified eight more SCs revealed that several of these SCs appear to have been mentioned earlier in the literature as well. For instance, parts of the essence of what we identified as 'social justice and inclusion competence' had also been identified by Bauermeister and Diefenbacher (2015) as 'social justice'. Similar to our 'stakeholder and policy coordination competence', Frisk and Larson (2011) identified 'stakeholder engagement and group collaboration competence' as one of the key SCs. Based only on this finding we cannot be certain that these SCs are universal. However, similarities of the SCs suggests the need future research into relevance of SCs in multiple contexts. The findings also indicate that the SCs identified in this study are not exclusively for the BoP context. Hence, the identified SCs have the features of generic competence. However, the SCs also have features of comprehensive competence i.e. they are the integration of knowledge, skills, and attitudes. Hence, the SCs have features of competencies related to generic and holistic approaches. An important implication of these is, depending on the context in which the sustainability competencies are being defined and used, they can be seen as generally applicable or situationally specific.

5.2. Meaning and significance of the SCs in the study area

While there are SCs relevant in multiple contexts, the results also show that some of the SCs have contextual importance. Below, we discuss relevance of some of the 15 SCs in the specific BoP, Ethiopian, context.

5.2.1. Competence to utilize indigenous resources

In general, local knowledge is crucial in the BoP environment because one of the features of this context is lack of formal institutions (Scott, 2017). Indigenous knowledge systems have the potential to contribute towards a more sustainable world (Kakoty, 2018). Let us look at two examples of the importance of indigenous human and natural resources in Ethiopia. Regarding health care, a significant majority of the

human population and the livestock relies on indigenous medical practices and medicines (Demie et al., 2018). Another example is the Konso peoples' indigenous water and soil conservation practices. Using their more than four centuries old engineering and environmental knowledge, the Konso people protect the environment and cope with difficult environmental challenges by constructing stone terraces. This has been recognized as an 'outstanding universal value' and registered as one of the UNESCO World Heritage sites (UNESCO, 2011; Mulat, 2013). Hence, sustainability professionals in Ethiopia need the competence to realize the potential of indigenous wisdom and resources and to capitalize on these to facilitate sustainable development.

5.2.2. Social justice and inclusion competence

Few points about the socio-political reality of the BoP context under study help to understand the contextual meaning and importance of this competence. Since the early 1990s, the Ethiopian political system is ethnic-based federalism that paid utmost attention to ethnic identity and undermined national unity. This system grants the regional states the right to self-determination up to secession (Bélair, 2016). Ethnic tensions and related conflicts are serious problems the country is grappling with (Abbink, 2011). Hence, social justice, inclusion, tolerance, fairness, participation, and repairing past and current harms are crucial for social sustainability in the country.

5.2.3. Systems thinking competence

From the practical examples our respondents gave, systems thinking is sustainability professionals' understanding that an organization does not exist or function in isolation; it is part of social, economic, and environmental systems. Its actions affect other systems, and vice versa. This agrees with the meaning of systems thinking in the literature (Molderez and Ceulemans, 2018). This understanding helps the sustainability professional to guide their organization in a more responsible and sustainable path.

5.2.4. *Examples of sustainability activities in some corporate organizations operating in Ethiopia*

To get insights into how sustainability is conceptualized and practiced in the corporate organizations whose experts participated in our study, we conducted interviews with five expert-participants. Three of these participants indicated that in their organizations sustainability is consider to be corporate social responsibility (CSR) in forms of community engagement and philanthropic programs. These include donations to charity organizations, mainly motivated by corporate image building. However, in the other two organizations, in addition to charitable donations, sustainability activities are directly related to core business processes aimed at enhancing environmental sustainability. In one of the two organizations (an airline), airplane wings were locally modified by which it succeeded in reducing airplane fuel consumption. In the other organization (an international brewery), they managed to reduce water consumption. Research has shown that reduction of water consumption, particularly by industries, is essential for sustainable economic development (Zhang et al., 2018).

5.3. Interrelationship of sustainability competencies

Our findings indicate that the identified SCs are interrelated and complementary. Next, we discuss the interrelationship of selected SCs.

5.3.1. 'Systems thinking competence' and 'competence to balance sustainable development dimensions'

The two SCs complement each other. The former is holistic thinking that systems and subsystems are interrelated (Roorda, 2013). The latter is about prioritizing the three dimensions (or subsystems) of sustainable development. In the Ethiopian context, there are practical situations that call for both of these SCs. Such experiences shared by our expert-respondents indicate the same.

One of the respondents commented the following about social and environmental impacts of floriculture industries in Ethiopia. "*...workers are paid very low wages; they are not protected against harmful chemicals, and the environment is exposed to harmful practices. All this is happening because of too much focus only on short-term financial benefits. The government is not doing enough because of its focus only on the growth of its GDP which is happening at the expense of communities and the environment.*"

Another respondent said, *"...there are minimum requirements investors should fulfil regarding social and environmental impacts to get investment license. However, the requirements are just on paper without practical application.*" The need to consider environmental and social aspects of development is also suggested in the literature (Gast et al., 2017).

5.3.2. Transdisciplinary competence

Transdisciplinary competence is one of the additional SCs suggested by the experts. The competence includes readiness and skills to work with experts from other disciplines beyond one's own. One of the SCs that complement transdisciplinary competence is systems thinking. The latter helps to realize the interconnectedness of different systems and facilitates transdisciplinarity because it is "...a tool for weighing, making decisions and taking action." (Molderez and Fonseca, 2018, p. 4399).

Regarding the practical situation vis-à-vis transdisciplinarity in the study context, our expert-participants indicated that cooperation of experts with others beyond their domain is crucial but not common. The meaning of this competence as suggested by the experts it is not different from the definition in the literature. For instance, Sakao and Brambila-Macias (2018, p. 1400) define transdisciplinarity in terms of its features. That is, "...relating to socially relevant issues, transcending and integrating disciplinary paradigms, participatory research, and searching for a unity of knowledge."

5.3.3. "Stakeholder and policy coordination" and "resource utilization" competence

"Stakeholder and policy coordination competence" and "resource utilization competence" are related. In 2016, Ethiopia launched its second five-year Growth and Transformation Plan. Among the basis for this plan are Sustainable Development Goals of the United Nations (NPC, 2016). Respondents mentioned this as a positive step that gives the country opportunities to tap global technological and financial support vis-à-vis sustainability. However, stakeholder and policy coordination at local levels is not encouraging. The respondents also indicated that sustainability-related top-down interventions without meaningfully involving local communities did not succeed. The respondents also stressed the importance of jointly

designing and implementing interventions to avoid duplication of work, to efficiently utilize resources, and create synergy.

5.3.4. Interpersonal, transdisciplinary, and 'stakeholder and policy coordination' competencies

Interpersonal competence is required to facilitate collaboration of stakeholders and experts (Wiek et al., 2011). Hence, it is related to transdisciplinary competence and Stakeholder and policy coordination competence.

Transdisciplinary competence and stakeholder and policy coordination competence have similarity as both encourage stakeholders to work together towards more sustainability. However, the SCs involve different stakeholders. While the former has to do with professionals working in different aspects of sustainability, the latter concerns any actors be it professionals or others, individuals or groups.

5.4. Implications for theory and practice on sustainability

This study brought together three fields of research: sustainability, competence, and base of the pyramid context. The point of departure in our study relates to the unique features of the BoP context that set it apart from high income contexts. Our assumptions are: competence is context specific; and the BoP has unique features. Therefore, we expected that these features may require a different set of SCs.

Results of the study showed that selected SCs, identified earlier mainly in Eurocentric contexts, are relevant to the BoP context under study as well. Experts in the BoP suggested additional SCs as important for the BoP context. Some of these additional SCs have been found to be relevant to non-BoP contexts as well. This has an important implication on context-specificity feature of competencies or sustainability competencies. The findings are believed to stimulate discussions whether sustainability competencies are universal regardless of differences in socioeconomic contexts.

The findings have implications for practice as well. They can serve as starting points for education for sustainable development. They indicate what competencies are required by sustainability change agents. Findings of this study give a clue that (some) SCs could be relevant in multiple contexts regardless of

socioeconomic differences. Hence, future studies to empirically confirm this in multiple contexts are suggested (see Section 6 for details of our suggestion for future studies).

6. Limitations and suggestions for future research

The nature and purpose of the study does not lend itself to generalization of the results. Therefore, the findings indicate the kinds of SCs that are relevant mainly in the Ethiopian context. We cannot be certain whether the SCs we identified will be equally relevant in other contexts. However, we expect the SCs to be relevant to other countries that share the unique features of BoP contexts. The study showed that previous studies in contexts other than the BoP also identified some of the eight additional SCs. This suggests the possibility that some of these SCs could be relevant in non-BoP contexts as well. However, further studies into the universality of the newly identified SCs are required. Future studies could first identify SCs that are relevant in multiple BoP contexts. Next, they can conduct the same study in multiple non-BoP contexts and compare the results. This may enable us to see if SCs are universal regardless of difference in socioeconomic contexts.

One of the limitations in this study was issues related to how three participants completed parts of the questionnaire. That is, oversight of parts of the description given to a SC by one expert, attaching one's own meaning to a SC instead of the descriptions in the questionnaire by another, and paying less attention to the operational definitions of key concepts in the questionnaire by a third expert. This was the case although we took various pre-emptive measures. These include personal meetings with the experts; provision of operational definitions; provision of documents related to the qualitative data analysis; pilot testing; and reviewing of the qualitative data analysis process and the questionnaires by the coauthors. Other limitations stem from limitations of the Delphi method. These include lack of proper guidelines for Delphi studies vis-à-vis selection of experts, determining consensus, number of experts, and continuous modifications of the method (Gupta and Clarke, 1996). Future Delphi studies should learn from this and take measures including the aforementioned ones to reduce misunderstanding or oversight. Awareness about these issues prior to designing the study helped us to carefully plan and execute our Delphi study.

Sustainability issues are complex. Small steps such as identification of SCs for different contexts may contribute towards more sustainability. The purpose of identifying SCs is to enhance the potential and contribution of sustainability change agents. Therefore, we recommend follow-up studies on the application and effectiveness of such competencies.

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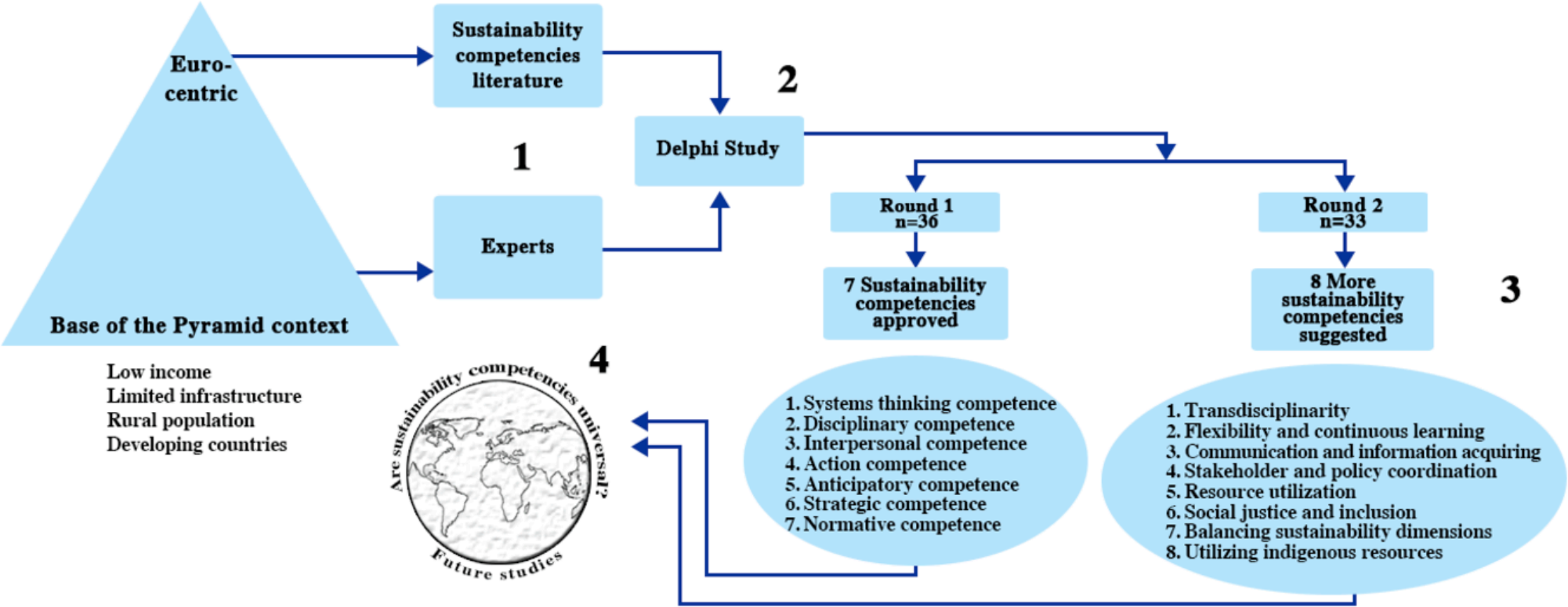
Base of the pyramid context has unique socioeconomic features

Fifteen sustainability competencies are identified for a base of the pyramid context

“Systems thinking” and “transdisciplinary” competencies are highly rated

Some sustainability competencies could be universal. This needs further enquiry


Euro-centric
Base of the Pyramid context
Low income
Limited infrastructure
Rural population
Developing countries
Sustainability competencies literature
Experts
1
2
Delphi Study
Round 1 n=36
7 Sustainability competencies approved
Round 2 n=33
8 More sustainability competencies suggested
3
4
Are sustainability competencies universal?
Future studies
1. Systems thinking competence
2. Disciplinary competence
3. Interpersonal competence
4. Action competence
5. Anticipatory competence
6. Strategic competence
7. Normative competence
1. Transdisciplinarity
2. Flexibility and continuous learning
3. Communication and information acquiring
4. Stakeholder and policy coordination
5. Resource utilization
6. Social justice and inclusion
7. Balancing sustainability dimensions
8. Utilizing indigenous resources