

13th Global Conference on Sustainable Manufacturing - Decoupling Growth from Resource Use

Evaluating sustainable development from a child's perspective - a proposal of Sustainable Child Development Index (SCDI)

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Abstract

In Social Life Cycle Assessment (SLCA), the UNEP guideline proposes the five stakeholder groups to investigate the corresponding social issues from a whole-population perspective. Despite the relevance of children in inheriting and forming the society in the context of sustainable development, children are neglected as a relevant stakeholder group. To consider children's interests and influence in SLCA from a top-down perspective, a literature review is conducted to identify relevant topics and gaps related to the assessment of child development. The results categorize the main aspects of child development into six themes: health, education, safety, material condition, relationship, participation, and a newly proposed theme environmental aspect. Furthermore, to address the existing gaps, the Sustainable Child Development Index (SCDI) is proposed to consider relevant aspects of children development on an outcome and a context level, with regard to newly-proposed environmental aspects.

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Peer-review under responsibility of the International Scientific Committee of the 13th Global Conference on Sustainable Manufacturing

Keywords: Child development; Social Life Cycle Assessment; Sustainable Child Development Index; Sustainability assessment; Sustainable development

1. Introduction

Sustainable development (SD) was defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” by the Brundtland Commission [1]. This definition considers intra- and inter-generational equity, and also highlights the right for every human being, whether adult or child (defined as aged under 18 [2,3]), to be granted the opportunity to develop in freedom and in a well-balanced society by satisfying basic needs and protecting the environment [4–6]. The International Union for Conservation of Nature Resource et al. [7] stated that “we have not inherited the Earth from our parents; we have borrowed it from our children”. This statement emphasizes the significant relationship between inter-generational equity, children and SD.

Among the existing sustainability assessment approaches, Life cycle sustainability assessment (LCSA) method has obtained increasing attention. LCSA combines life cycle assessment (LCA), social LCA (SLCA) and life cycle costing (LCC) to cover environmental, social and economic aspects

[8,9]. To assess social issues, the United Nations Environment Programme (UNEP) [10] proposes five stakeholder groups for SLCA: workers, consumers, local communities, value chain actors and societies from a whole-population perspective. Children are the stakeholders inheriting and forming the society; however, despite the fact that children's relevance in the context of SD, they are ignored as a relevant stakeholder group. Any sustainability assessment approach neglecting children's interests and their influence on SD is insufficient. Thus, the stakeholder group children should be added to LCSA or, for a simplified assessment, even replaces the current five stakeholder groups, to acknowledge children's relevance for achieving inter-generational equity [11].

As the needs of children development (CD) and their susceptibility to external factors are different from those of adults, approaches for evaluating SD from a child perspective, that is sustainable child development (SCD), need to be developed independent of whole-population-oriented assessments. The Child Development Index (CDI) [12,13] was proposed by applying an integrated index to evaluate the development of children with regard to health, education and basic needs (nutrition). It owns very limited themes and does

not allow a comprehensive assessment of environmental and resource-consumption aspects in the context of SD. A widely-accepted, clearly-stated and comprehensive index system to evaluate CD in the context of SD is still missing [11].

Hence, the objectives of this study are 1) to provide overview of the different aspects addressed as well as the existing gaps in existing CD studies, and 2) to propose the Sustainable Child Development Index (SCDI) as a holistic concept covering aspects of CD and addressing existing gaps by considering regional conditions, interdependencies, and environmental aspects. The preliminary SCDI framework provides an innovative perspective to evaluate SD; the adoption of SCDI to SLCA and other sustainability assessment approaches are expected.

2. Reviewing themes related to sustainable development of children

In this section, a literature review related to child rights, CD and well-being is presented as a basis for identifying relevant themes, subthemes, criteria and existing gaps. The results are used as a basis to propose SCDI. As a first step, the basic rights of children and underlying themes regarding SD are identified and combined as a foundation for SCD. The Millennium Development Goals (MDGs) [14] serve as a reference for ensuring that the rights and themes comply with SD goals. As a next step, after defining the frame for SCD, relevant themes, subthemes and criteria are identified based on existing studies of CD and child well-being.

2.1. Basic rights and Millennium Development Goals

Children are born with basic rights [15]. The protection of these basic rights needs to be considered as the core principles of SCD. In 1989, the Convention on the Rights of the Child (CRC) of the United Nations defined basic rights of children, including the best interests of children, non-discrimination, participation, survival and development [2,3]. The NGO Child Right and You [15] further elaborated these rights by pointing out relevant themes: the right to survival (to health, nutrition, unpolluted environment, and access to clean drinking water and sanitation), the right to development (to education, parental and alternative care, leisure and recreation), the right to protection (with birth registration and nationality, free from exploitation, abuse and neglect), and the right to participation (to express their concerns on child-related issues, and access to media). All of these rights need to be considered as the foundation of SCD [11].

Next, the MDGs are analyzed, to check if the identified rights and themes reflect general SD goals. The UNDP stated eight MDGs [16]: Eradicating extreme poverty and hunger; achieving universal primary education; promoting gender equality and empowering women; reducing child mortality; improving maternal health; combating HIV/AIDS, malaria and other diseases; ensuring environmental sustainability; developing a global partnership for development. There are many direct links between MDGs and the identified rights.

For example, eradicating extreme poverty and hunger, reducing child mortality, and combating HIV/AIDS, malaria and other diseases can directly link to the physical and mental health of the rights to survival. Besides, ensuring environmental sustainability means that children live without the danger of environmental degradation. Achieving universal primary education connects to the rights to development in education. Those aspects clearly indicate that children are the foundation of SD, and strongly support the rights and principles claimed in CRC and MDGs: health, safety, education and participation [11]. Based on the rights and principles, the themes, subthemes and criteria related to SCD are identified and classified correspondingly through a literature review in the following section.

2.2. Identification of relevant themes, subthemes and criteria for child development

This article focuses on studies that refer to overall aspects of CD and well-being rather than ones with only specific emphasis on single areas, like health or education. In total, 23 studies are selected as references from an academic, organizational and governmental background, to identify comprehensive set of themes, subthemes and criteria [11]. Based on the discussed rights and principles, a set of relevant themes can be determined: health, safety, education and participation. Moreover, by reviewing selected studies on CD and well-being, two additional themes are identified: relationships and economic status [11]. Subthemes and according criteria associated with the themes are categorized as well.

2.2.1. Health

According to the literature review, health is a theme of high importance for CD. Without securing their health, children have difficulties surviving and obtaining skills, and this negatively affects future human capital. Risk behavior, nutrition, child mortality, immunization coverage, eating and physical activity and subjective health are identified as the six most relevant subthemes [11].

- Behavior of children that puts their health at risk needs to be evaluated. Tobacco and alcohol use are the two criteria identified especially for children of school age. In addition, adolescent fertility is also recognized as relevant, as it could increase the risk of venereal disease.
- Sufficient nutrition is a basic need for children and their physical development. Low birth weight, being overweight and obesity, breastfeeding and being underweight are identified as relevant criteria for the subtheme nutrition.
- Reducing child mortality was already suggested in the MDGs and is frequently mentioned in the literature. To determine child mortality, infant mortality and under-five mortality are two commonly suggested criteria.
- Sufficient vaccination programs represent the quality of health services to avoid particular communicable diseases

in children. Full immunization, vaccinations for diphtheria tetanus toxoid and pertussis and vaccinations for measles are three criteria identified as relevant.

- Both physical activity and healthy diets help children to strengthen their physiological function. Having breakfast and eating fruits are two commonly recommended criteria.
- Apart from judging health from an objective perspective, the subjective perspective is also relevant. Criteria such as satisfaction and perceived quality of life relate to the subjective health of children.
- Other subthemes, such as oral health, injury, mental health, maternal health, health financing, water and sanitation, child disability, chronic disease and hazardous pollutants, are mentioned, but not frequently addressed in the reviewed literature. HIV and malaria are rarely considered though they are directly linked to the MDGs.

2.2.2. Education

Education is another theme of high relevance for SCD. Learning values, behavior, knowledge, skills and competencies, is a key pathway of SD [17], and important for children to develop their capability to work and to elaborate life. By means of the literature review, school attainment, attendance of basic education, early childhood education and advanced education (high schools and colleges) are the subthemes with high priority for evaluating the educational progress of children [11].

- The subtheme school attainment can be evaluated by means of the criteria mathematical and reading literacy. Higher literacies indicate that children may have better performance and knowledge obtainment.
- Enrollment in primary school is identified as the criteria most often used to assess if children obtain fundamental knowledge.
- Early childhood education and advanced education are two essential subthemes. Early childhood education is important to attain day-to-day knowledge in the initial phases of life. Advanced education refers to the attainment of higher levels of knowledge for further development of skills, which strengthens the position of children in the employment market.
- Other subthemes mentioned as relevant for assessing the theme education are transition to employment, parents' education qualification, extra-curricular subjects and public expenditure on education.

2.2.3. Safety

Children are fragile in the early life stage and need parents and adults to care for and support them. Without appropriate care arrangements, children can easily be exposed to dangers and engage in delinquent behavior. Violence and crime, child care arrangements and child abuse and punishment are identified as the three major subthemes of safety [11].

- Violence in school and juvenile delinquency are identified as the two main criteria for evaluating safety.
- Child abuse can cause physical and mental damage and, consequently, has a negative effect on CD.
- Child care arrangement is relevant for ensuring the safety of children. The identified criteria are formal care and adult supervision after school.
- Governmental efforts to ensure child safety, like birth registration, child labor, child marriage, and female genital mutilation (FGM) are also concerned in literature.

2.2.4. Relationships

Relationships with family, peers and community are identified as common subthemes in the literature for the evaluation of CD. Effective relationships are important for children with regard to their long-term emotional and psychological development [18]. Communication between parents and children, as well as family structure are the two main criteria reflecting the family relationship, however, these are typically based on subjective evaluations [11].

2.2.5. Economic Status

Economic status is another relevant theme for assessing CD. The main subthemes are relative household income poverty, household without job, material deprivation, risk housing, hunger and food shortage, crowded household and macroeconomic situation. If the income, material and housing are not sufficient, CD can be restricted, possibly triggering the early leave from school and possible crimes [11].

2.2.6. Participation

Participation is not widely discussed in most of the reviewed literature, however, participation in public affairs via voting, joining civic activities and engaging in media can motivate children to defend their rights and become responsible and active citizens [11].

Nevertheless, there are several potential subthemes that have not been addressed in the reviewed literature, but that might be of high importance for SCD. In the next section, gaps of current SCD studies are discussed. Furthermore, based on these gaps, additional subthemes are suggested for the development of the SCDI [11].

2.3. Challenges of assessing child development

Through the literature review, several gaps were identified with regard to the current analysis of CD. The heterogeneous classification of subthemes and criteria, interdependency, regional and societal bias in addressing certain aspects, the limited subthemes and criteria and the lack of including environmental aspects currently impede the implementation of SCD [11].

- **Heterogeneous classification of relevant aspects:** There is currently no generally accepted classification scheme [19–22], and the choice of themes, subthemes and criteria is subjective and depends also on the availability of related data [20,23].
- **Interdependencies:** An assessment of the dependencies between different subthemes and criteria is missing [24]. Even though the SCDI framework is a first step towards a standardized and explicit classification scheme, the interdependencies between the criteria and subthemes needs to be further investigated [11].
- **Regional and societal bias:** The identification of subthemes and criteria is often based on the concerns of industrialized countries. As a consequence, the criterion “overweight and obesity” is associated with higher attention in the current literature than the criterion “underweight”; malaria and diarrheal disease, which are very critical to young children, receive little attention in the reviewed literature as they mainly occur in Sub-Saharan Africa and South Asia. In addition, some criteria are based on particular societal preferences in evaluating CD. For example, the proportion of children living in single-parent families and stepfamilies, which is often used to negatively judge family relationship; however, it could be arbitrary [18]. Similarly, child labor also usually leads to negative impacts, like increasing health risks and deteriorating school performance; however, some positive effects, like the development of discipline, responsibility, self-confidence, and economic supports to families (especially important in some developing countries), may also occur [25]. The evaluation framework needs to allow customization and expansion for different regional preferences for mitigating the bias [11].
- **Limited subthemes and criteria:** There are still some issues may affect CD, but lack proper consideration in the literature. Examples include vocational education, equality in education, demographic structure, youth unemployment or availability of media for children [11].
- **Lack of including environmental aspects:** Environmental aspects are not addressed in CD research yet. For assessing CD regional effects, regional issues related to the exhaustion and scarcity of resource, like water vulnerability and the use of renewable energy, should be considered in SCD [11].

In the next section, the SCDI framework is outlined to address the identified gaps and to support a more comprehensive approach for the assessment of SCD.

3. Framework of Sustainable Child Development Index

Based on the results of literature review, a new concept, the Sustainable Child Development Index (SCDI), is proposed. It aims to provide a consistent and comprehensive assessment of CD from a sustainability perspective and to address existing gaps by identifying subthemes and criteria, distinguishing between an outcome and context level,

considering regional conditions and including environmental aspects.

The SCDI is structured as a two-level scheme, including an outcome and a context level. Both levels rely on the six earlier identified themes: health, education, safety, economic status, relationships and participation as a foundation and include the additional theme environment on the context level to come up to the requirements of sustainability.

The framework distinguishes the subthemes and criteria in two parts: outcomes of CD and contexts that have the potential to influence the outcomes. The contextual subthemes and criteria can affect CD, but this causal relationship is not binding. For instance, growing up in a single-parent family may, but does not necessarily have to increase the likelihood of having negative effects on CD. This implies the contextual subthemes and criteria are associated with the outcome of CD, but should not be considered as direct measures of the outcome [24]. In this sense, on the outcome level, the subthemes showing children’s status and capability are selected. For example, the subthemes nutrition, child mortality, injury, subjective health, oral health, mental health, chronic disease and disability are listed on the outcome level of the theme health [11].

Furthermore, the additional theme environmental aspect is added on the context level to bridge current CD to SD. Based on the definitions of environment, resource accessibility is identified as relevant and needs to be considered in the development of the SCDI framework. Freshwater vulnerability is proposed as a subtheme of the theme environmental aspects due to the close relation to everyday needs, the regional and local circumstances and the relevance to maintaining freshwater access for achieving inter-generational equity. The criterion hazardous pollutants is not considered under the theme environment aspects, as it is included under the theme health, in line with current literature.

In addition, new subthemes are proposed to strengthen the comprehensiveness of the evaluation on the context level. These subthemes include provision of vocational school, equality in education, youth unemployment, availability of media for children, fossil fuel energy consumption and demographic structure. An overview of the outcome and context level proposed in this work is provided in Figure 1 [11]. The new subthemes are described as follows.

- **Vocational education** (may include technical schools, workshop schools, development agencies, etc. [17]) is designed to prepare individuals for a vocation or a specialized occupation and is directly linked with a nation’s productivity, competitiveness and equality in education. It affects quality of life of children and personal development, attitudes and motivation [11].
- **Equality in education** is essential for all children. Gender equality in education plays a core role in protecting children’s basic right to education. If gender equality is low, this leads to a vicious circle in personal development of girls, human capital and gender conflicts in society.

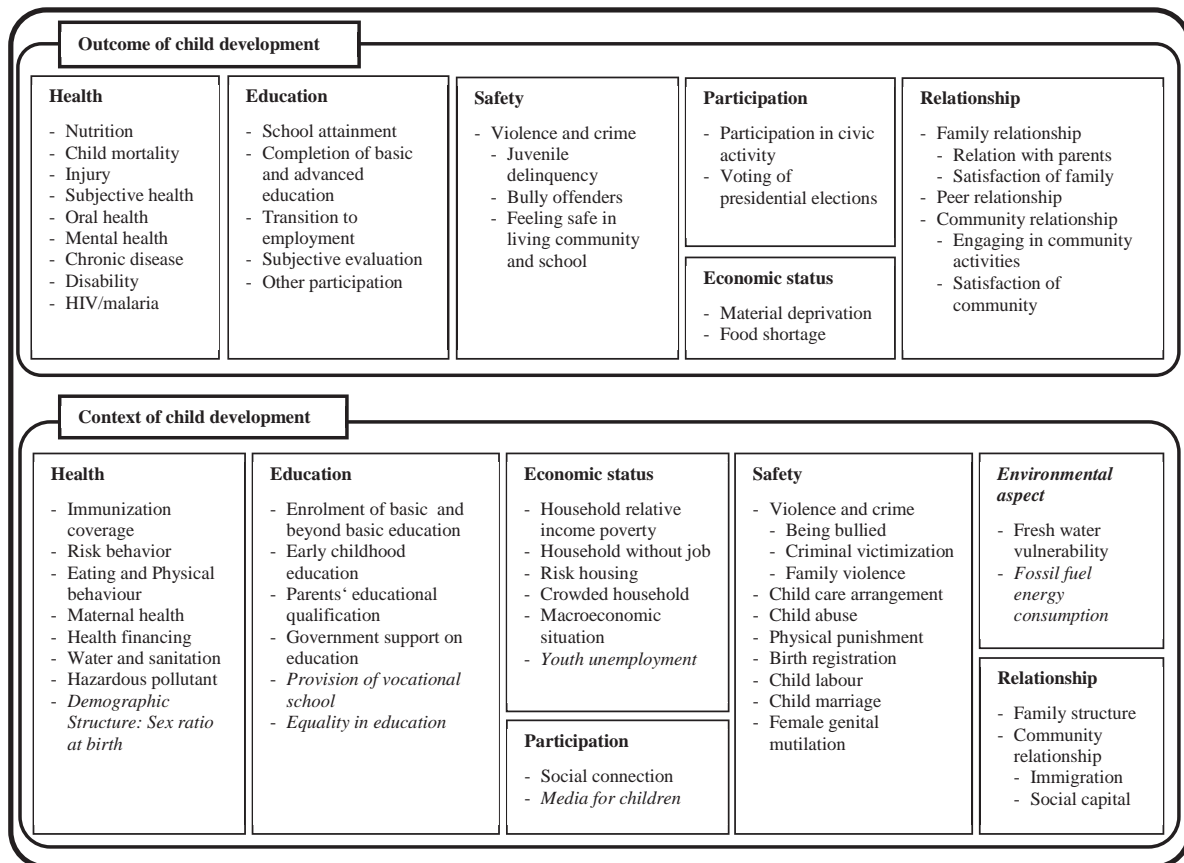


Fig. 1. The framework of sustainable child development index, adopted from [11]

- The global youth unemployment rate in 2013 was 12.6%, close to a crisis critical peak [11,26]. The economic and social costs of unemployment and widespread low quality jobs for young people continue to rise and undermine the potential of economies to grow [26].
- Media (newspapers, periodicals, books, broadcasts, websites, television shows and news, etc.) designed for children is important for children to attain knowledge and to participate in public affairs by expressing their opinions. Furthermore, well-designed media can provide information without harmful content, such as violence [11].
- Fossil fuel is a non-renewable energy source. High fossil fuel energy consumption speeds up the depletion of fossil fuel resources and damages the rights of future generation to access these resources [11].
- Demographic structure (especially the sex ratio at birth, estimated as the number of boys born per 100 girls) can reflect the attitude towards gender equality in society. High sex ratios at birth may be attributed to sex-selective abortion, infanticide and underreporting of female births due to a strong preference for sons [27,28].

Moreover, including additional subthemes into the assessment based on regional relevance shall be enabled. Subthemes related to societal value and prerequisites in the SCDI, which can be adapted according to country-specific situations. These subthemes can refer to FGM, armed conflicts or critical diseases, for example HIV or malaria [11].

To further develop the SCDI, relevant criteria need to be identified that properly represent the identified subthemes, and the quantification of these criteria for the calculation of the numerical SCDI needs to be defined. The goal is to provide quantitative values to compare the performance of countries and to reflect their potential toward SD. The SCDI then can be used to support decision making in policy and societal development and bridge SCD to current sustainability studies. In addition to its application on the country level, the SCDI framework intends to complement SLCA methodologies by introducing children as an additional stakeholder group in SLCA, respectively LCSA. As SLCA is struggling with lacking data, children could even replace the current stakeholder groups for a high-level assessment, and SCDI could provide the basis for an integrated indicator framework [11].

4. Concluding remark

The article proposes a new approach by taking children as the key stakeholder group for SD, since they represent the link between current and future societies. Based on the comprehensive literature review, six relevant themes were identified for assessing SCD: health, education, safety, economic status, relationships and participation. The relevant subthemes were identified and classified correspondingly. To address the critical gaps in current studies on CD, the two-level SCDI framework is proposed, considering relevant themes and subthemes of SCD in an outcome and a context level, including environmental aspects, and integrating additional aspects with regional relevance. Thus, the SCDI enables the evaluation of the potential towards SD at a country level, and can support decision making in policy and societal development. Besides, in SLCA, children could even replace the current stakeholder groups for a macro-level assessment, and SCDI could provide the basis for an integrated indicator framework.

However, some limitations still persist. The proposed framework will have to be continuously revised when additional literature and information with regard to CD become available. Furthermore, the interdependencies between the different subthemes and criteria need to be discussed in more detail in future studies, as these correlations could influence the categorization of the criteria. As CD aspects are often multi-faceted with complex and indirect cause-and-effect relations, interpretation is not always straightforward. These will be addressed in more detail in the future research, and the applicability of SCDI will be tested in exemplary case studies.

Acknowledgements

The authors gratefully acknowledge that the study is funded by the German Research Foundation DFG (SFB 1026/1 2012), Collaborative Research Center CRC1026 (Sonderforschungsbereich SFB1026).

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