

Article

Impact Pathways to Address Social Well-Being and Social Justice in SLCA—Fair Wage and Level of Education

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Abstract: Social well-being and social justice are meant to create a positive outcome meaningful for people and societies. According to the guidelines of social life cycle assessment, especially well-being should be considered as the main area of protection to assess social impacts of products. In addition, equity and equality need to be addressed in terms of social justice to ensure a fair and ethic society. However, even if a lot of studies focused on the definition social indicators to assess resulting impacts, neither have scientific or common agreements been founded to define a valid set of indicators, nor have consistent pathways from inventory towards impact indicators been established. This work, therefore, proposes possible pathways from life cycle inventory to impact assessment of two social midpoint categories: fair wage and level of education. Respective cause-effect-chains are developed based on the environmental life cycle assessment principle. Correspondingly, social inventory indicators throughout direct impacts to midpoint and endpoint categories are defined. Three endpoint categories are included (economic welfare, damage to human health and environmental stability) to address social well-being and social justice. Qualitative characterization factors and a scaling method are proposed to evaluate the impacts according to threshold and reference values from valuable literature.

Keywords: social life cycle assessment; social well-being; social justice; fair wage; education; impact pathway

1. Introduction

Global recognition of sustainability started to appear in the early 1970s with the release of the book “Limit to Growth” to raise awareness on “(...) how to bring about a society that is materially sufficient, socially equitable and ecologically sustainable, and one that is more satisfying in human terms than the growth-obsessed society of today” [1]. Additionally, the Brundtland Commission, in 1987 [2], defined that sustainable development has to meet the needs of the present generation without compromising the ability of future generations to meet their own needs. Further, the Rio Summit, in 1992 [3], identified the four principles: equity, futurity, environment, and public participation to underline that sustainable development goes beyond pure environmental aspects.

In this connection, the life cycle sustainability assessment (LCSA) method was established, consisting of a contemporary implementation of life cycle assessment (LCA), life cycle costing (LCC) and social life cycle assessment (SLCA) [4]. Hereby, the assessment of the environmental dimension is the most advanced method within the LCSA framework, as LCA is a standardized method [5]. The LCC assesses the economic dimension and is relatively new within sustainability assessment [6]. The SLCA has been defined as the technique to assess the positive and negative social impacts along a product’s life cycle [7]. The interest on this method has been growing since its creation, especially when considering global supply chains. However, a number of gaps still remain in the methodology regarding its comprehensive and practical implementation [8–12]. Further, impact indicators are broadly mixed up with inventory indicators and so far most of the social impacts are not described within a consistent impact pathway following the cause-effect-chain derived from the LCA framework [13,14]. According to these aforementioned drawbacks, the goal of this work is to display the interconnections of social inventory and impact indicators in a more detailed manner by defining detailed pathways for the two midpoint impact categories: fair wage and level of education. These two topics were selected, as they directly and indirectly influence all stakeholder groups identified within the guidelines of SLCA.

2. Social Factors and Sustainability

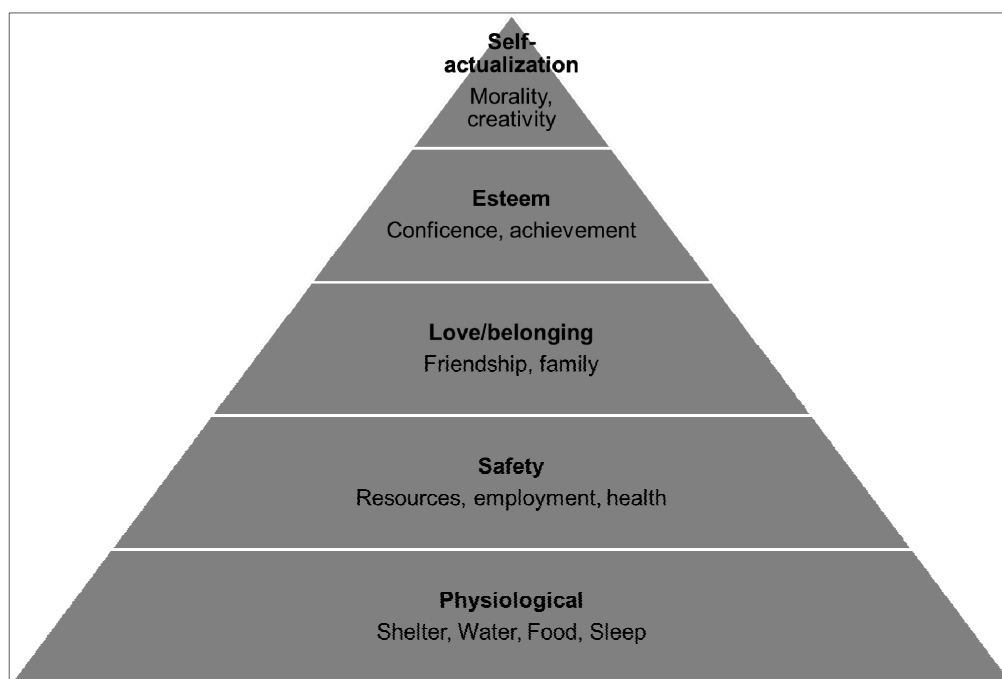
According to the SLCA guidelines and its complementary methodological sheets [7,15,16] 31 impact sub-categories have already been defined. They were identified as specific social impact categories of the five stakeholder groups: workers, consumers, local communities, (global) societies, and value chain actors. For each of the subcategories some indicators are suggested in the methodological sheets. However, a general set of indicators accepted by the scientific community has not been selected yet. So far the existing indicators are fairly mixed up regarding impact and inventory level and a linkage to the cause-effect-chain cannot be drawn. However, Jørgensen *et al.* [17] has already grouped social indicators for several topics. This can serve as a starting point for the further development of two pathways to describe fair wage and the level of education. Whereas, wages or fair wage has already been listed as one of the meaningful aspects to be considered in the assessment of

labor rights and decent working conditions, as reported in the SLCA guidelines, education was identified as “one of the key aspects for social and economic development” [18]. Both, fair wages and education, are highly relevant for the future development of human beings and consequently of regions and countries, as the basis for prosperity and wealth.

To describe the fundamentals of reaching prosperity Maslow’s pyramid of needs originated in the psychology literature of the 1940s and, more specifically, in an article by Albert Maslow in the Psychological Review [19,20] can be used. A hierarchy of five needs is given by starting with physiological and ending with self-actualization needs. The prioritization is needed to focus on the expenses that a medium person is going to afford at first to achieve a certain level of personal well-being.

Consequently, on the physiological level needs relative to hunger, thirst and pain *etc.* are to be fulfilled. Maslow stated that if one need level is fulfilled an individual aims to fulfill the next one according to the priority presented in the Figure 1. According to that, the second level of priorities is safety and security, which includes also sanitation and health. After that on the third level the necessity to guarantee a constant living standard for a certain period requires to have child care, as well as transportation and marginal resources. The belongings of these three levels can be easily connected to definitions of social well-being (see Section 2.1), as it can be seen as the basis of a healthy and wealthy life. Further, on the last two levels beyond the necessity of relationship, family and friends a certain number of entertainments and cultural events are considered to fulfill individual needs to address self-esteem and self-actualization including also ethical values. This is connected to the definition of social justice (see Section 2.2), which goes beyond social well-being and expresses that equity and equal opportunities should be enabled for all individuals belonging to society. Thus, within this study two areas of protection (AoPs) were identified as relevant: social well-being and social justice.

Figure 1. Maslow’s Hierarchy of Needs [19].



2.1. Social Well-Being

Well-being, often referred to as human well-being, is meant to create a positive outcome meaningful for people and for many sectors of society, as it can be defined as a general sense of happiness and satisfaction [21]. Therefore, United Nations Environment Programme (UNEP) defines human well-being as the AoP within SLCA and as an ultimate target of sustainable development [7]. This comprehensive AoP encompasses the ability to live a healthy, naturally long and decent life, to enjoy and respect social membership, and to satisfy basic needs [22]. It is also connected to good living conditions (e.g., housing, employment) that seem to be essential aspects of well-being [23,24]. Based on these aspects, and, in addition to the human and labor rights, a long set of indicators have already been presented within the current literature.

Further, well-being is considered to be the central goal of human activity, which can be split into different components: physical and social well-being [25,26], even though they are connected very closely. Within social well-being several social aspects should be considered, such as: paid work, economic living standard, access to knowledge, leisure and recreation time, social relationships, *etc.* Physical well-being is more related to the subjective and psychological state that an individual feels relatively to a defined well-being state, such as: health, comfort, happiness and satisfaction [27]. Human health was always mentioned, as a relevant part of the assessment, which builds one of the fundamentals of social well-being. Even if, human health originally was located in LCA the connection to and relevance for SLCA cannot be negated. Norris [28], therefore, mentioned that human health and socio-economic impacts are closely connected. Further, Dreyer *et al.* [22] stated that human health needs to be connected to SLCA. Thus, within this paper it is proposed to consider human health as a part of social well-being to address the effects of fair wage and the level of education in this context.

Consequently, within this paper social well-being is included as one AoP for the indicator pathways for fair wage and education. The main target is to give a clearer idea of how these two topics affect social well-being in a positive and/or negative way.

2.2. Social Justice

Social justice is based on the principles of equal opportunities and justice, like security or freedom, which are based on a social contract (individual vs. societal). Thus, it is appropriate to complete the AoP of social well-being. In addition, social justice can cope very well with the aspect of intergenerational equity, as defined by the Brundtland report [2].

One of the targets of social justice has been described by Schmitz: “If we are to live in peace, we need a high level of consensus on a long and mostly inarticulate list of “do’s and don’t’s” that constitute the ordinary sense of injustice with which we navigate in our social world” [29]. Therefore, it is important to define principles of equality and solidarity.

In addition social justice is part of distributive and procedural justice theories used in social science [29–31]. The basic concept is to ensure that one can fulfill his due without compromising others in doing so [29]. Furthermore, the constitution of the International Labor Organization (ILO) affirms that “universal and lasting peace can be established only if it is based upon social justice” [32].

Thus, social justice is relevant in connection with wages (e.g., payments below minimum or non-poverty wage) but also in connection with education (e.g., access barriers to educational institutions). Consequently, within this paper social justice is defined as one AoP to complete social well-being and further to show how fair wages and education can influence social justice and the respective endpoints.

3. Defined Endpoints

With regard to the considered AoPs and the two pathways for fair wage and level of education three endpoints were found to be important. In the following sections, they are described to create a deeper understanding of how the pathways are to be read.

3.1. Economic Welfare

Economic welfare is not yet defined with regard to sustainability assessment or SLCA. However, it was addressed and partly connected to sustainability before with the development of the Genuine Progress Indicator (GPI) [33,34] and the Index of Sustainable Economic Welfare (ISEW) [35–37]. Education and wages were included at least indirectly via expressing social inequality within the society in both indexes (including a certain uncertainty and neglecting differences between man-made and natural capital). However, proper indicators are missing, as the GPI and ISEW use average values and do not consider the life cycle perspective, which is used in LCSA and SLCA [33,34].

Within this study economic welfare will be evaluated to describe social well-being and social justice by focusing on social effects resulting from education and fair wage. It is certain that the absence of education down to a critical level influences the economic welfare in a negative manner, as it has a decisive influence on human capital and also on the organizational performance of workers [38–41]. The qualification and quantification of these effects will be further assessed in Section 5. In addition, a low or “unfair” wage affects the ability of the workers to fulfill his own and his family’s need that encompasses food, housing, clothes, education, *etc.* Thus, wages may serve as an indicator to describe economic welfare.

3.2. Environmental Stability

Environmental stability describes the fragility of nature and has already been expressed in terms like ecological stability or the balance of nature, including the variability of species, which can be expressed in species loss or biodiversity loss [42,43]. The main target of environmental stability from a SLCA point of view is to preserve a stable environmental situation, which sustainably can renew and remain over a long-time period based on enhanced environmental knowledge to ensure social well-being (including human health). Therefore, education is needed to be able to take the necessary steps to preserve environmental stability, as the dependencies of man and nature are not obvious [44]. Further, education influences the awareness for environmental protection and of long-term effects to the environment [45,46]. However, even if this may lead to a decrease of environmental impacts in more educated countries (e.g., industrialized civilizations), mostly a shifting of burdens occur towards less educated countries, as production processes likely to be outsourced. Consequently, education at

the end of the global supply chains is needed, as environmental protection is dependent on a certain knowledge [47–49]. In connection with the defined AoPs environmental stability is highly relevant, as at least social well-being is strongly influenced by this endpoint [50].

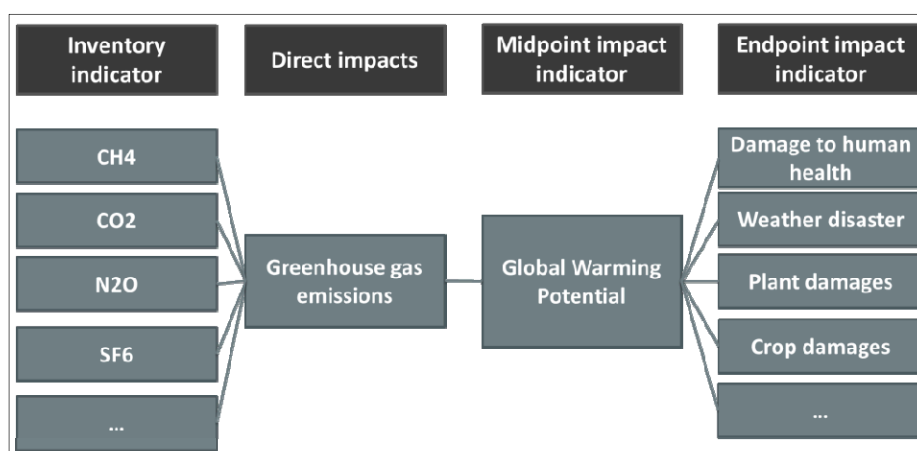
3.3. Damage to Human Health

Damage to human health is a broadly known and defined impact category on the endpoint level [51]. Originally used within the LCA framework the discussion nowadays leads to include it rather into SLCA, as it addresses rather social than environmental impacts [9]. For several substances and emissions characterization factors are already described and defined (e.g., van Zelm *et al.* and Jolliet *et al.* [52,53]). However, these characterization factors are so far limited to the environmental mechanisms and no connection to social impacts has been drawn. Thus, damage to human health is included as an endpoint category to address human health effects within the AoP of social well-being caused by education and wages. For instance, education can have an influence on health, as higher education shows some correlation with higher income possibility and consequently decreases the risk of malnutrition. Further, higher education in terms of broader knowledge can help to avoid certain diseases or sickness (see e.g., [54,55]). In addition, health is directly affected by the financial means of people, in particular in a society where a national health service is not guaranteed by the government and the health insurance rate depends on person's or family's wage. Moreover, if the wage is around the minimum level, it hardly can cover all basic needs, such as adequate food and clothes and consequently impacts the individual's health conditions. Therefore, fair wages influence social justice via damage to human health.

4. Pathways to Social Well-Being and Social Justice

Although, several indicators within the SLCA framework are defined, the cause-effect-chain (environmental mechanisms) [13] broadly used within the LCA framework are so far not considered (see Figure 2).

Figure 2. Exemplary cause-effect-chain according to the LCA framework adapted from [13].



However, this inter-relation seems also reasonable within the SLCA framework to give a clear understanding of impacts and the related causes, as it interlinks indicators on the inventory side with indicators representing a certain midpoint or endpoint impact. Therefore, the respective cause-effect-chains

for fair wage and the level of education are developed. Within the development of impact pathways for fair wage and the level of education it has been focused on the interrelation between inventory, midpoint and endpoint indicators.

4.1. Fair Wage

Fair wage can be defined as “a wage fairly and reasonably commensurate with value of a particular service or class of service rendered” [8]. The value of fair wage can be very variable, depending on the country where it is measured, the sector of the considered company or product and the economy and strategy of both.

It is clear that a fair wage can have a subjective component depending on the aspirations and the concept of good living standard that everyone imagines, but in this work we are trying to identify all objective factors that should and/or could be considered.

Three main definitions have been identified and reported in the Methodological Sheets presented by UNEP/SETAC [8]:

- Minimum wage (non-poverty wage)
- Local prevailing industry wage
- Living wage

They represent some referencing values or thresholds that should be identified and measured to assess fair wage. Minimum wages are defined according to the ILO standard: “the lowest level of remuneration permitted (...), which in each country has the force of law and which is enforceable under threat of penal or other appropriate sanctions. Minimum wages fixed by collective agreements made binding by public authorities are included in this definition” [56]. A minimum wage has been established by most of the countries in all regions. However, some European countries (such as Austria and Italy) have not established a general minimum wage, as a minimum industrial income is fixed by the collective bargaining agreement by sector and enforceable by law. Other countries, such as Somalia, Singapore and Qatar have not accepted a defined minimum wage. However, as in all cases no minimum wages were fixed, the resulting consequences can be quite different. Whereas, in Europe the economic and social system preserves people from impoverishment, this cannot be assumed for Somalia. Thus, it should be reflected also in connection with the definition of the impact pathway for fair wage.

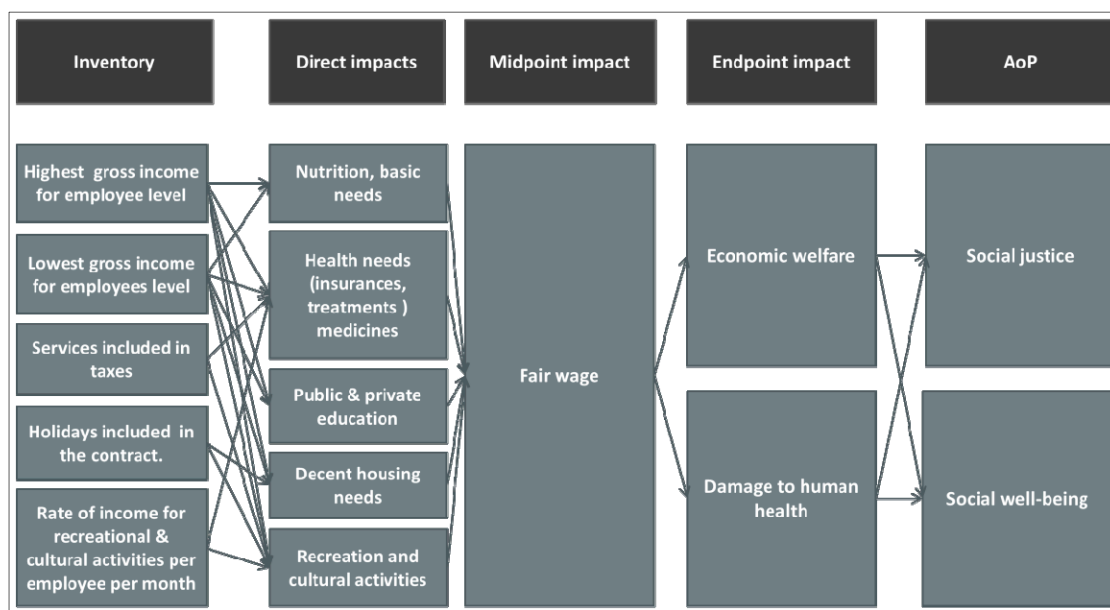
Local prevailing industry wage does not yet have a commonly accepted definition, which states, if it is higher than minimum wage or if it really covers all employees’ basic needs. A possible definition could be that, if “the hourly wage, usual benefits and overtime, paid in the largest city in each county, to the majority of workers, laborers, and mechanics” [50] a local prevailing industry wage is established. In addition the living wage concept has been developed to give a reference salary, which allows the workers and their families to afford not only basic needs, but also a decent life style that is considered acceptable by society at its current level of economic development [51].

To define a fair wage, the minimum wage or non-poverty wage and the local prevailing industry wage as well as the living wage has to be taken into account. Crucial therefore is the salary a worker receives. If, e.g., a payment is below or equal to the minimum wage, while another worker earns more

for doing the same job this cannot be stated as fair according to ILO [57–64] and would have a negative impact on the defined midpoint category fair wage and consequently affects the AoP social justice. In addition, due to the low income the respective person may not be able to participate in social life, so his or her well-being cannot be reached (and also health issues may be ignored, if the low salary leads to malnutrition).

Based on the mentioned influences Figure 3 shows the pathway of fair wage from inventory data to the AoPs throughout midpoint and endpoint assessment. All indicators defined, represent thresholds to assess a fair wage on the midpoint level influenced by inventory indicators. Therein, the gross income is the most important part, as it has a direct influence on nutrition and health needs as well as decent housing needs. Consequently, this affects the damage to human health and the economic welfare. Additional influences can be assumed due to inventory indicators like included holidays, which may affect damage to human health and thus influencing the AoP social well-being (including human health effects).

Figure 3. Pathway fair wage orientating on the cause-effect-chain used in LCA expressed by using inventory, midpoint and endpoint categories with regard to the defined AoPs.



If an income is fair or not depends on which kind of costs it can cover for a decent quality of life. According to the amount of the income it can have direct impact on the ability to realize a decent living standard, e.g., decent nutrition, health services, decent housing, decent education level for all components of the family, *etc.*

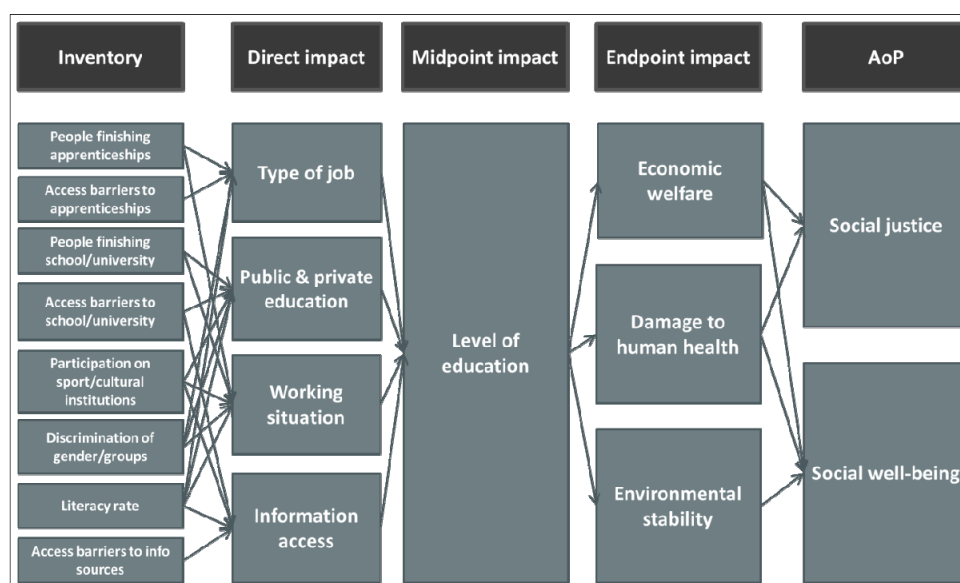
4.2. Level of Education

The importance of education for social and economic development has already been recognized by several groups and institutions. The United Nations Educational, Scientific and Cultural Organization (UNESCO) in this regard states that “education is one of (...) (the) principal fields of activities. Since its creation in 1945, the organization has worked to improve education worldwide believing it to be the key to social and economic development” [18]. In addition to this, the World Bank Group defines

education as “a powerful driver of development and one of the strongest instruments for reducing poverty and improving health, gender equality, peace, and stability.” [65].

In addition, Hauschild *et al.* [66] identified education as a needed additional impact category for SLCA. Therefore, the defined levels of primary, secondary and tertiary education provided by ILO can serve as a basis [67,68]. Further, with regard to education apprenticeship programs and university degrees need to be evaluated. To structure and display influences and effects of education a pathway is displayed in Figure 4.

Figure 4. Pathway level of education orientating on the cause-effect-chain used in LCA expressed by using inventory, midpoint and endpoint categories with regard to the defined AoPs.



Within this pathway, the level of education is seen as a midpoint indicator influencing the defined endpoints economic welfare, environmental stability and damage to human health. The endpoint economic welfare is affected by the direct impacts type of job and working situation via inventory categories like finished apprenticeships or literacy rate. Working situation here is defined as a midpoint indicator influencing the level of education, via, e.g., cases of discrimination. It is assumed that a higher/healthier level of education, which influences the economic welfare, can only be reached without discrimination. Further, the level of education influences economic welfare, as it creates positive or negative effects on the health and safety of workers due to e.g., lack in training or gain of knowledge [69]. The level of education is also influenced by the direct impact public and private education via inventory categories like, e.g., finished school and university degrees, access barriers to schools and universities. Further, the level of education influences the environmental stability via information access and public and private education, as both factors are relevant to gather a broader understanding of the surrounding environmental system and the connected cause-effect-chain of environmental impacts. In addition, the level of education affects damage to human health, via working situation and information access, which may influence human health through participation on sports/cultural institutions and access barriers to info sources. All described endpoints affect at least one of the two described AoPs social well-being and social justice.

5. Implementation and Characterization

5.1. Fair Wage

To define characterization or scaling factors for fair wage according to the described pathway, thresholds need to be identified. For a qualitative and quantitative determination, the lowest, highest and average salary per employee in the respective field of work for each company involved in the life cycle has to be collected. By comparing the lowest, highest and average salary respectively with minimum and living wage a first evaluation can be given to consider the current received salary fair or not. The minimum wages and its country specific values are usually published on the ILO website. This can function as a first threshold under which a salary cannot be considered as fair in accordance with human rights. Once inventory data are collected for the lowest (LI) and highest income (HI) per level of employee, according to the inventory indicators highest and lowest gross income in Figure 3, it needs to be compared with the minimum wage defined for the respective region. If LI and HI are both lower than the minimum wage not all basic needs can be satisfied and negative direct impacts are caused.

Another threshold is represented by the living wage. Herein, the defined inventory indicators rate of income for recreational and cultural activities and services included in taxes are considered beside the highest and lowest gross income. A worker with a living wage should be able to afford a basic but decent life style for himself and his family. That means that it should cover the cost of nutritious low-cost diet, the cost of acceptable basic housing and clothing as well as other costs for a decent life. It should be also included a certain amount of margin to cover expenditures such as events and emergencies to enable a sustainable life. The ILO [57] summarized four different ways to calculate the living wage in different countries (US, Canada, UK). According to the US methodology the living wage is the “income required to maintain a safe but modest standard of living” and could be estimated by the following equation [70]:

- $Cost_{Food}$ are costs for covering a nutritious model diet. It can be calculated by assuring a certain amount of calories per person and by making sure that the diet counts acceptable amount of proteins, fats and carbohydrates, as well as calories [71]
- $Cost_{Housing}$ should be based on a housing standard. It can vary depending on the methodology used to calculate it. One example is suggested from Environmental Policy Institute [72] that uses rent for a two-bedroom unit for the 40th percentile rental in the locality
- $Cost_{Transport}$ covers the expenditures for the public transportation, if it is available. It can be very variable depending on the local conditions
- $Cost_{Health}$ and child care covers health insurance costs or other costs to guarantee a minimum level of health for the family
- Others include further expenditures to have a good quality of life such as costs for cultural events or entertainments
- $Taxes - Tax_{Credits}$ are considered so that workers are able to afford an acceptable living standard on their disposable income

Once the lowest wage is higher than the minimum wage, it is compared with the living wage calculated by the equation above by using regional or country specific data. The following conditions can occur:

- (1) Minimum wage < LI < living wage – negative impacts occur at least for one of the midpoint categories
- (2) $LI \geq$ living wage – the income is relatively close to the fair wage and causes at least a consequent positive impact
- (3) If $LI \gg$ living wage and the rate of income for recreational and cultural activities $\neq 0$ – the income is fair and produces positive impacts

The next step is to define an average prioritization of the basic needs satisfaction, as it is assumed that the income cannot cover all needs. Therefore, like introduced above the pyramid of needs created by Maslow is used [19]. The prioritization is needed to focus on the expenses that a medium person is going to afford at first.

Taking all the aforementioned parts into account, different levels of impact can be assigned based on a scaling. All values are assigned according to the life cycle inventory data of LI and HI:

- a. $LI, HI <$ minimum Wage – worst performance.
- b. $LI <$ minimum Wage \wedge minimum Wage < $HI <$ living wage – bad performance; it depends on the amount of HI and which costs can be covered according to priority given by the Maslow's hierarchy needs.
- c. Minimum Wage < $LI, HI <$ living wage – very critical performance; it depends on which costs can be covered.
- d. Minimum Wage < $LI <$ living wage \wedge $HI >$ living wage – critical performance according to the covered costs.
- e. $LI, HI >$ living wage – good performance depending on how many further cultural & recreational activity are actually covered by the current wage.

The evaluation of (d) and (e) is directly dependent on the number and quality of recreational and cultural activities that can be afforded. The higher the number and the higher the quality, the better the quality of life is and the relative social performance of the product.

5.2. Level of Education

Based on the findings in Section 4.2, characterization factors are needed to qualify and later on also quantify the encountered interrelations within the defined pathway (see Figure 4). In comparison with wages education can hardly be expressed in monetary values and thus the characterization here has a qualitative focus rather than giving quantitative values.

The characterization is done to describe the defined midpoint category level of education and to represent also the connection to the defined endpoint categories. Therefore, all inventory categories included in Figure 4 are considered. They are described qualitatively by announcing positive and negative effects resulting from the respective inventory indicator. Further, a direct link is drawn to the defined direct impacts, which influences the midpoint impact category level of education.

A detailed evaluation can be taken from Table 1. Therein, according to the inventory categories in Figure 4 three different levels of education are described. With regard to public and private education these are:

- School education
- Apprenticeship education
- University education

To consider a preferably broad range of effects are included in the characterization, which influences the percentage of graduates' differences in gender and groups' equality, and the availability of proper programs to support the students.

Further, additional effects influencing the level of education in society are taken into account. Apriori here are considered:

- Access barriers to educational institutions (schools, apprenticeship programs and universities)
- General discrimination of gender/groups
- Literacy rate
- Access barriers to info sources
- Participation in sports/cultural institutions

Access barriers to educational institutions lead to restrictions in terms of society members attending educational institutions and thus affecting the level of education. Included are mainly monetary obstacles, but also barriers for disabled people. These inventory category influences mainly the direct impacts public education and type of job and thus the economic welfare and environmental stability on the endpoint level. Positive impacts result from low monetary boundaries and good solutions for different disabilities.

Discrimination as an inventory category describes the imbalances concerning gender or group affiliation (e.g., religious, background), which might create an imbalance within society, as the level of education is affected. On the midpoint level the working situation is biased, which results in effects on economic welfare on the endpoint level. Positive effects result from fair working hours independent from gender or group affiliation and no exclusion of gender or groups in any educational institution.

Literacy rate defines a proxy value of alphabetized people, which is highly relevant to achieve a sufficient education level. It influences the working situation, public and private education and the information access. At the endpoint level the economic welfare is affected, whereby positive effects result from a high share of alphabetized people independent from social classes.

Access to info sources measures information, which is free and easy accessible, as education is i.a. based on available information. Here, linkages to public and private education and information access can be drawn influencing the endpoint environmental stability but also damage to human health. Positive impacts result from the absence of censorships and the accessibility for all people independent from social classes.

Within participation in sports/cultural institutions a proxy value for people attending sports or cultural institutions is created, which seems relevant to create a general knowledge and to ensure physical education. This inventory category can have an effect on the public and private education and

influences the economic welfare and the damage to human health. Positive impacts are created by a rather high number of people attending sports and cultural institutions independent from social classes.

Table 1. Characterization for the midpoint impacts category level of education including the direct midpoint indicators and the affected endpoints.

Inventory indicator		Characterization	Effects on mid- & endpoints
People finishing school	No. of people finished school (compulsory and secondary education [46,68]) ^a	Positive impacts are based on the availability of school programs [72,73], and a preferably high number of finalizations; Negative impacts are based on a low number of finalizations	Midpoint: Influence via type of job and public education; Endpoint: Influence on economic welfare and environmental stability
	No. of male/female persons finished school (compulsory and secondary education [46,68])	Positive impacts are based on a approx. 50/50 share of gender ^b ; Negative impacts are based on a great inequality in gender	
People finishing apprenticeships	No. of people with finished apprenticeships ^c	Positive impacts are based on the availability of apprenticeship programs [73] and on preferably high number of finalizations; Negative impacts are based on a low number of finalizations	Midpoint: Influence via type of job; Endpoint: Influence on economic welfare and environmental stability
	No. of male/female persons finished apprenticeship	Positive impacts are based on a approx. 50/50 share of gender ^d ; Negative impacts are based on a great inequality in gender	
People finishing university (tertiary education)	No. of people finished university ^e	Positive impacts are based on the availability of university programs [72,73], on preferably high number of finalizations; Negative impacts are based on a low number of finalizations	Midpoint: Influence via type of job and public education; Endpoint: Influence on economic welfare, and environmental stability
	No. of male/female persons finished university	Positive impacts are based on a approx. 50/50 share of gender ^b ; Negative impacts are based on a great inequality in gender	

^a Here are people included, which are in the respective age to finish school. ^b Unless there are justified reasons of why a 50/50 share cannot be reached. ^c Here are people included, which are in the respective age to finish an apprenticeship and due to their school graduation are unable/unlikely to attend university.

^d Unless there are justified reasons of why male/female persons cannot pass the apprenticeship program.

^e Here are people included, which are in the respective age to finish university.

6. Discussion

With the completed investigation of how to structure the social assessment of fair wage and education an important step towards a more consistent and transparent assessment of social impacts has been done. The two covered topics are of utmost importance, when dealing with intra- and intergenerational equity. Even if the characterization for the level of education, thus far, is on a qualitative basis, ground work has been done to develop quantitative values. The qualitative scaling for fair wage is related to thresholds and reference values (e.g., minimum wage) suggested by literature and current standards.

For both pathways a representative variety of inventory categories and indicators were included. The represented ones have been found as the most important ones. However, the given selection is not meant to be exclusive and further indicators shall be included to consider, e.g., the influence of violation, ethical values and socio-economic classes on the level of education and fair wage. Similar applies for the characterization and the defined endpoints. Thus, further research needs to be done, e.g., within the characterization of discrimination. A paragraph should be included to describe exceptions from discrimination cases, such as work not feasible for female persons or certain groups. In this regard it is proposed to orientate on the ILO convention No. 111 [62]. In addition, fair wage can be a measurement of the discrimination, if different wages are given to people with the same level of employment but of a different gender or race [74].

Further, more impact categories can be included, when expanding this work, e.g., social interaction seems to be a relevant part with regard to fair wages and education. In addition, parallel to the two defined midpoints fair wage and level of education interconnections with other midpoint categories, e.g. working condition are possible, but not described within this study. However, a higher level of education can influence the job security in a positive way and thus also working conditions [46]. Fair wage alone can affect the motivation of the worker, which can also influence the working condition.

7. Conclusions

Possible pathways for fair wage and education have been provided including proxy approaches for the characterization towards the identified impacts. Characterization factors were presented on a qualitative ground to establish a relation between causes and effects of social indicators. It was shown that both considered midpoint categories fair wage and level of education are highly relevant for prosperity and well-being. The ultimate aim is to reach a level of fair wages for all workers and a level of higher education to gather economic welfare, an increase in environmental stability and a decrease in damage to human health.

Even if this is absolutely true and relevant today, prospectively discussions about unjustified high wages (e.g., manager salary) are demanded. Furthermore, a single-sided education target (more is always better) may lead to negative drawbacks, as physical work is increasingly outsourced (e.g., in connection with our globalized world and global supply chains). In addition, a loss of physical abilities occurs, which lead to a decrease in human health. Therefore, unilateral targets aiming at higher income and education need to be transformed towards a reasonable optimum, serving as the basis for an independent sustainable society. This might be especially relevant for health care and the craft sector.

In addition, the industrialized countries, which are assumed to be higher educated, face the fact of demographic changes, as increasing prosperity accompanies with rapidly decreasing birth rates [75].

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Author Contributions

Sabrina Neugebauer is the main writer of the paper. The paper was designed together with Marzia Traverso and René Scheumann. The research for the parts describing the level of education was made by Sabrina Neugebauer and for the parts describing fair wage by Marzia Traverso. René Scheumann supports in writing the introduction. All authors proofread and approved the final manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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