

# Climate Change Education for Sustainable Development in Regional Educational Landscapes

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**Abstract:** There is a widespread consensus that global climate change can only be contained and managed through a quick, fundamental and worldwide societal transformation involving politics and all societal forces. The great importance of the local level of action and climate change education (CCE) as well as other education on climate change mitigation and adaptation is becoming increasingly recognized. However, the practical implementation still requires much development – at least in Germany. Even having many good community-based, individual measures and projects regarding climate education is apparently not sufficient. It is also necessary to systematically develop and network the diverse activities of CCE in all educational areas to provide citizens with an opportunity for lifelong learning as well as link the climate-related activities and political measures. For the strategy of establishing connections between key actors that is the central focus of this article, the term *Bildungslandschaften* (educational landscapes) will be further developed. This term is becoming increasingly prevalent in Germany and is related to the international concept of *learning cities*. As a basis for this perspective, Sect. 1 provides a geopolitical overview of the role of the local level and education, from the UN Conference on Environment and Development in Rio de Janeiro (1992) to the Sustainable Development Goals (SDGs) and the Paris Agreement on climate change (2015). Finally, the respective situation in Germany will be critically examined. In Sect. 2, the author presents his six-dimensional model of sustainable development and Climate Change as a theoretical foundation, with education as an independent dimension: climate change education for sustainable development (CCESD). Sect. 3 deals with some aspects of Educational Landscapes of ESD and especially CCESD and the Fridays for Future movement. Sec. 4 presents the example of the city Osnabrück and the actual situation of the complex 30-year previous history of climate education and an educational landscape for sustainable development. Based on a survey carried out in ten German cities, the different situation, ways and problems are presented as a summary in Sect. 5.

**Keywords:** Education for sustainable development, Urban sustainability, Regional sustainability, Educational landscape, Local Agenda 21, Sustainable Development Goals (SDGs), Sustainable learning cities, Sustainable city, Sustainability, Climate change, Climate protection, Climate change education

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## 1. The General Role of Education in Managing Climate Change

The need for fundamental societal learning processes to address central problems of humanity was already a topic of discussion as early the seventies. For instance, the topic was mentioned in the UNESCO Publication *Learning to be* (Faure et al. 1972) and in the Club of Rome book *No Limits to Learning* (Botkin et al. 1979), which mainly discussed the challenges related to the energy supply after the oil crisis in 1973.

## 1.1. International context

In an international context, education, social participation and action at the community level are clearly seen as playing key roles in sustainable development, as reflected in many international resolutions and documents. At the UN Conference on Environment and Development in Rio de Janeiro in 1992, for example, several resolutions were passed that had a major global historical impact, especially on sustainable development. These resolutions include Agenda 21 (UN 1992a) and the UN Framework Convention on Climate Change (UNFCCC). The objective of this Convention was to ‘stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system’ (UN 1992b). At that time, education, training and public awareness were already considered as factors contributing to climate protection (see Article 6 of the UNFCCC). This important aspect of education in the broadest sense was also formulated as Principle 10 in the *Rio Declaration on Environment and Development* in 1992, together with social participation. Furthermore, education was described in detail as a general instrument for sustainable development in Chap. 36 of Agenda 21, while the protection of the atmosphere was a central topic in Chap. 9. At the same time, the importance of action at the community level was recognized in both UN documents, and Agenda 21 even dedicated a separate chapter, Chap. 28, to this subject (see Sect. 1.2).

While the importance of these factors is internationally recognized, there is great variation up to now in how consistently the individual states have implemented the far-reaching UN resolutions from Rio de Janeiro in 1992 and from the many follow-up conferences. The same is also true for resolutions from the annual Conferences of the Parties (COP) in the area of climate change.

In the following, I will present and critically evaluate a few recent developments at the UN level with respect to the broad and globally important field of action *education and climate change*.

The UN proclaimed 2005 to 2014 as the Decade of Education for Sustainable Development (DESD). From the beginning, climate change was a very important international issue of the DESD (e.g. UNESCO 2005a/b, 2009a/b).

Furthermore, climate change and education played a key role during the second follow-up UN Conference, Rio+20, which was once again organized in Rio de Janeiro in 2012, as reflected in the resolution ‘The future we want’ (UN 2012). Nevertheless, at least until 2011, there was still an educational deficit in climate strategy and politics that was apparent worldwide. UNESCO sought to address this deficit. On its website, UNESCO wrote the following: ‘Through its Climate Change Education for Sustainable Development programme, UNESCO aims to make climate change education a more central and visible part of the international response to climate change. The programme aims to help people understand the impact of global warming today and increase "climate literacy" among young people’<sup>1</sup>. The issue of climate change education (CCE) was expected to be given much higher priority after 2015, a year in which the UN and UNESCO set foundations for

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1 <http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/climate-change-education>, 1.7.2011

future action at two global conferences, Agenda 2030 and the UN Climate Conference in Paris. In September 2015, Agenda 2030 (UN 2015a) was issued with 17 Sustainable Development Goals (SDGs)<sup>2</sup>. The following three SDGs are the most relevant for CCE:

- ‘Ensure access to affordable, reliable, sustainable and modern energy for all’ (SDG 7),
- ‘Take urgent action to combat climate change and its impacts’ (SDG 13)
- ‘Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all’ (SDG 4).

The UN Climate Conference that was held in Paris at the end of 2015 differed from the previously organized International Climate Conferences in so far as it is generally regarded as a breakthrough in global politics. The highly ambitious aim of keeping global warming below 2 °C or better, below 1.5 °C, nevertheless requires very consistent global climate policies right from the start that aim at reducing the greenhouse gas emissions to zero as quickly as possible.

*Adaptation* and *mitigation* are two fundamental terms in the debate on climate change. The International Panel on Climate Change (IPCC) defines mitigation as ‘an anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases’. Adaptation may be defined as ‘an understanding of how individuals, groups and natural systems can prepare for and respond to changes in climate or in their environment’.

It would be impossible to achieve this target of adaptation and mitigation, which is so vital for humanity, without relying on systematic educational measures in terms of lifelong learning whose aim is to significantly shape the attitudes and behaviour of as many people as possible. In the general phrasing of the Paris Agreement on climate change (UN 2015b), which has been repeatedly mentioned in the international UN resolutions since 1992, the important role of education is emphasized: ‘Affirming the importance of education, training, public awareness, public participation, public access to information and cooperation at all levels on the matters addressed in this Agreement’. Due to the great significance of the topic climate change, it makes sense to use a special term for the related education: *climate change education for sustainable development* (CCESD or, concisely, CCE). The corresponding German term *Klimabildung für nachhaltige Entwicklung* (short form: *Klimabildung*) has been seldom used up to now in Germany (see Sect. 1.3).

## **1.2 Importance of the local action level**

The previously mentioned Chap. 28 from Agenda 21 (‘Local authorities’ initiatives in support of Agenda 21’) (UN 1992a) was the starting point of numerous sustainability initiatives and processes in thousands of communities in numerous countries in the world, all under the name of ‘Local Agenda 21’. This global movement is mainly characterized by the participation of citizens and non-governmental organizations that foster fundamental learning processes among active members as well as the local public. Incidentally, the idea that towns and cities as well as education are of high importance when it comes to shaping the development of our future was already expressed 20 years

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<sup>2</sup> All SDGs contain ‘Sub-SDGs’, i.e. precisely formulated subgoals – a total of 167.

before in the UNESCO publication *Learning to be* (Faure et al. 1972). The subsequent UNESCO report *Learning: The Treasure Within* (Delors et al. 1996) already deals with the idea of learning societies (see Sect. 3).<sup>3</sup> The increasing importance of the local action level can be seen in the founding of two international organizations representing the towns, cities, communities and rural districts. Unfortunately, both organizations fail to mention CCESD explicitly within the scope of climate change and sustainability.

In 1990, the *International Council for Local Environmental Initiatives* (ICLEI) was founded at the conclusion of the first World Congress of Communities for Sustainable Development at the United Nations in New York. This council includes a worldwide association of towns and cities, communities and rural districts, which has gone by the name *ICLEI – Local Governments for Sustainability* (<http://www.iclei.org/>) since 2003 (ICLEI 1994). Although one focus of their work is climate change, CCESD is not mentioned in any of their publications (see ICLEI 2015, 2016a). Within the context of ICLEI, the Aalborg Charter of European Cities & Towns Towards Sustainability was adopted in 1994 and signed by approx. 2,500 local and regional administrations in 39 countries (<http://www.sustainablecities.eu>). In the Basque Declaration (ICLEI 2016b), the updating of the network's objectives refers explicitly to the SDGs and the Paris Climate Agreement. However, it is a surprising point of criticism that the issue of CCESD is not mentioned explicitly in any of the ten Local Agendas or the 15 pathways to sociocultural, socioeconomic or technological transformation in the Basque Declaration.

Another example of such an organization is the group European Network of Cities, Towns and Districts in Partnership with Indigenous Rainforest Peoples for the Benefit of the Global Climate (Climate Alliance), which was founded in 1990 and has grown to about 1,700 member communities from 26 European countries (<http://www.climatealliance.org>). Climate justice for the indigenous people in South America is a central aim. Neither of the two organizations explicitly declared local CCESD as one of their major targets, and although the latest publication of the Climate Alliance *Transforming Our World. Local Authorities for Global Sustainable Development* (Climate Alliance 2016) includes the network's offerings on CCESD, these only refer to informal forms (international campaigns, expositions). There are also other international networks of municipalities that express the importance of the local level for different fields of action, for example, the network Transition Towns and Fair Trade Towns.<sup>4</sup> But here too, education or CCESD in particular does not seem to play a major part. This clear deficit with respect to education in all these networks underlines the necessity of developing local holistic concepts of CCESD which will be primarily substantiated and presented by means of examples in this paper.

Ever since the UN's Agenda 21 was written in 1992, the local level has been recognized as an important factor. In 2015, the UN formulated sustainable development goals (SDGs) in its Agenda 2030. One example is SDG 11: 'Make cities and human settlements inclusive, safe, resilient and

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3 More detailed in Becker 2016, p. 126-128.

4 <https://transitionnetwork.org/> <http://www.transition-initiativen.de> <http://www.fairtradetowns.org/> / <https://www.fairtrade-towns.de>

sustainable'. This SDG along with SDGs 4, 7 and 13 on climate change form an argumentative basis in support of local CCESD. In Sect. 3.2., the SDGs are related to the ESD learning objectives (UNESCO 2017).

### **1.3. On climate policy, climate science and climate education in Germany**

All the conferences, resolutions and programmes on sustainable development (SD) and climate change mentioned so far were met with a strong positive response in Germany. At this point, I shall merely refer to some aspects of the political activities with respect to climate change. These include research and promotional programmes developed at the federal and regional levels that also refer in part to the local and/or community level, which is in the focus of this paper.

In 1997 on behalf of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), the *Deutsches Institut für Urbanistik* ('German Institute of Urban Studies'; DIFU) published the practical guide 'Climate Protection in Communities' (*Klimaschutz in Kommunen*; DIFU 1997), which was published in 2011 in an updated version of more than 500 pages (DIFU 2011). In a short chapter 'Public relations and consultation', the guide merely dedicates three pages (p. 160-163) to education in the sense of 'lecture and discussion events'.

Later, within the framework of the German National Climate Initiative, the Federal Ministry for the Environment (BMUB) developed promotional programmes for climate protection in communities, for instance, the 'Masterplan 100% Climate Protection' from 2012 as well as awards for 'Climate Communities' (see <http://www.klimaschutz.de>). The targets are reflected in the following four theses concerning the promotional programme:

- Climate protection needs leverage – a small impetus may have a strong impact
- Climate protection needs the economy – networking is necessary for climate protection
- Climate protection needs communities – towns, cities and communities promote climate protection
- Climate protection needs management – to identify potentials and use these to the fullest

To support community approaches and projects in a practical way, the *Service- und Kompetenzzentrum Kommunaler Klimaschutz* ('Service and Competence Center for Local Climate Protection') has used the previously mentioned guide 'Climate Protection in Communities' as a basis for publishing numerous brochures on individual topics, in which practical examples are presented as models. However, climate education is hardly mentioned (e.g. DIFU 2015a/b). What all these measures at the German federal level have in common is that they tend to disregard the role of CCESD or, to be more precise, hardly make any connection between climate protection measures and education or recommend such a connection. Neither do they refer to the educational material that was developed by the same ministry for the different school levels (e.g. BMUB 2009).<sup>5</sup> Of course, this is an expression of the lack of communal responsibility, mostly due to very limited financial resources and

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<sup>5</sup> Written enquiries from the author with regard to CCE to the BMUB, DIFU and with the European Climate Association did not lead to any appreciably different results.

the missing competences at the municipal level in terms of education on sustainable development and climate change subjects.

The policy document of the Association of German Cities (*Deutscher Städtetag*) ‘Adaptation to the Climate Change – Recommendations and Measures of the Cities’ (DST 2012b) also does not make any statement at all regarding any kind of CCESD, even though the Association of German Cities already emphasized the significance of education for the future development of the cities twice in the *Aachener Erklärung* (‘Aachen Declaration’; DST 2007) and in the *Münchener Erklärung* (‘Munich Declaration’; DST 2012a). The Munich Declaration even emphasizes the ‘increased significance of ESD’ in the introduction.

Whilst scientific climate studies generally deal with the respective natural science fundamentals and may also include socioeconomic, cultural and historic aspects if need be, they tend to ignore the educational aspect. There are two major exceptions of renowned research institutes that deal with this issue in a completely different manner:

In a more recent publication of the German Advisory Council on Global Change (WBGU 2011), the importance of scientific research and education in the social transformation process towards SD is raised as a subject of discussion. Closely related to this subject, the call for active participation by citizens (e.g. WBGU 2014) and the transformative significance of cities (WBGU 2016) are addressed in expert reports.

In recent years, the Potsdam Institute for Climate Impact Research (PIK)<sup>6</sup> has dealt with education in a special project and offered knowledge on the climate to interested educational actors in a creative manner (<http://www.klimafolgenonline-bildung.de>). The project focuses on the presentation of scientific expertise on the impact of climate change and its consequences. The portal makes it possible to study and visually display the impact of climate change on Germany on the computer with future and past scenarios based on data measured since 1900. In addition, teaching material is presented on the service portal <http://www.lehrer-online.de>, which is aimed at teachers from all school types and levels.

Naturally, in Germany, there has also been a diverse educational practice regarding the topic of climate change<sup>7</sup> and the related publications: Numerous didactical materials referring to the topic of climate protection can be found, for instance, on the national websites <http://www.bne-portal.de> and <http://www.globaleslernen.de> or as collected in the comprehensive literature database BNELIT for ESD at <http://www.bne-literatur.de>. An interesting international website is that of the non-profit foundation ‘myclimate’ (<http://www.myclimate.org>), with Swiss roots, which is counted among the leading providers of voluntary compensation measures worldwide. This foundation also stresses the great importance of CCESD and thus combines different dimensions of SD in its efforts. Nevertheless, it appears that the debate, the development and implementation of concepts in Germany

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6 <https://www.pik-potsdam.de> information on the educational project PIKee can be found at <https://www.pik-potsdam.de/forschung/klimawirkung-vulnerabilitat/projekte/projektseiten/pikee>

7 Initially, school-related networks worked in this respect, e.g. the Climate Alliance of Schools in Lower Saxony, which is no longer active.

have lagged behind the international level of discussion on CCESD. One indication of this – as already explained above – is that the German term *Klimabildung* has not yet become an established term within the German-speaking areas. In contrast, the term *climate change education* (CCE) is already a subject of an UNESCO Initiative (UNESCO 2010) and is a widespread term in academic publications (e.g. Leal Filho et al. 2007; Mochizuki & Bryan 2015). As early as 1999, the American portal <http://climatechangeeducation.org> was launched, which addresses all different kinds of groups of actors and is administered by a broad spectrum of educational actors.<sup>8</sup> Unfortunately, the field of education science has so far largely ignored the topic of climate change.

## 2. Climate Change Education for Sustainable Development (CCESD)

More than twenty years ago I defined a model of six dimensions, namely, ecology, economy, social justice, participation, culture and education<sup>9</sup> within the discourse on the term Sustainable Development. Thus, in terms of content, the model is in line with the idea of UNESCO as an international organization for ‘education, science, culture and communication’ on basis of democracy, development and human dignity. Naturally, this model holds true for all subjects of Sustainable Development also for global Climate Change and global Climate Protection<sup>10</sup>



Fig. 1: G. Becker: Six-dimensional model of SD and climate protection (six-pointed star).

<sup>8</sup> The comprehensive literature regarding CCE in the English-speaking countries cannot be discussed in detail here.

<sup>9</sup> Since 1999, this star graphic has been utilized and published by the author in different variations related to different topics (e.g. see Becker 2001, 2013, 2016, 2017). In the ideal case, all six dimensions are weighted to the same degree, which is expressed by the equal size of the points of the star. In practice, however, the six dimensions are mostly weighted differently in terms of the different interrelationships.

<sup>10</sup> A more extensive version of these sub-chapters are chapters 2 and 3 in Becker 2018 and Becker 2020a (Chap. 1 about ESD und Chap. 4 about Educational Landscapes of Sustainable Development) (German) and a short version (Becker 2020b): <https://www.bne.uni-osnabrueck.de/Becker/Publikationen1> (open access)

In addition, each individual dimension should be considered in a differentiated manner: This is clearly evident, for instance, for the social dimension, when understood as a demand of social justice for sustainable development and climate justice in particular. In the case of intergenerational justice as a perspective of time, the question arises as to how many future generations should or could be considered. In addition, there is also a geographical side of justice, which may be divided into at least four further levels, a subject that may be of a highly politically explosive nature:

- The social level of the individual city/region (e.g. Osnabrück)
- The national level (e.g. Germany)
- The level of industrial greater regions (e.g. EU)
- The less developed countries, in the past designated ‘Third World’<sup>11</sup>. In the meantime, the situation has become a bit more differentiated (emerging countries, Fourth World, Fifth World).

The highly complex subject of climate change, including climate change mitigation and climate change adaptation, is vitally important for the future humanity’s basis of life. The subject is characterized by its interdisciplinary nature, referring more or less to all other subjects or fields of action of (non)sustainable development. The subject of climate change may encompass topics such as living / buildings, consumption / raw materials, mobility / traffic systems, nutrition / health, water courses / water, biological diversity / nature of city, and so on. This is a further reason to use a specific term for the climate-based education work based on it: Climate change education (CCE), as I understand it, should always also be ESD and therefore CCESD. Due to its global significance, CCESD should always also be understood as global learning. The different conceptual ideas of SD are also reflected in the different definitions of CCESD. This is also true regarding the dimensions and competences to be acquired.

The six-dimensional model of SD presented in Fig.1 implies that ESD, or CCESD, relates to the five other dimensions. Along the lines of the argumentation in Sect. 2, the five dimensions related to education provide sound, differentiated bases for the didactical analysis and planning of ESD. This is especially true for CCESD, and for the development of local educational landscapes or learning cities (see Sect. 3).

It goes without saying that it is impossible to consider all dimensions in each individual project. How and when can aspects and dimensions that were initially excluded nevertheless be pedagogically considered? For instance, it is quite common to spread the different aspects / dimensions of a subject out over longer periods of time, particularly in the multiyear curricula of formal institutions of general education, such as schools, educational study courses and study components. Complex tasks can also be educationally offered in a complementary and cooperative manner in locally developed educational landscapes or learning cities. Such local frameworks may provide very good opportunities and should be considered when educational landscapes or learning cities are planned in

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<sup>11</sup> This level is of great importance and has also in Osnabrück been considered as a North-South problem of climate change for many years (see Sect. 4 on Osnabrück).



a community-based form of organization. However, in any case, this requires careful long-term planning and good coordination of the actors.

The cultural dimension has significance not only for the contents of ESD and CCESD, but also for the methods: there are also many other creative, cultural, artistic approaches and presentations that offer starting points for social transformation for various lifestyles. In this way, the educational measure will be very successful and the participants will enjoy it. Within the course of communal public relation activities or campaigns for climate protection, even the most different forms of cultural events may assume important functions for different target groups.

Another significant characteristic feature of ESD and CCESD (Becker 2018, Chap. 3.2) are the objectives of competences and learning as targets to be well achieved at local and regional level with their possible direct connection to practices of action and everyday life.

### **3. Educational Landscapes for Sustainable Climate Development**

This contribution focuses on the special importance of the local level of action for sustainably dealing with climate change and the role of education in this global challenge pertaining to the future of mankind. In the long run, local educational measures can only be successful if offered in all areas of education: This includes institutions related to family, preschool, school education, vocational education, university education as well as to enterprises and their employees. In the increasingly important field of informal education, many creative persons are active. Consequently, education, in the broad sense represented here also comprises information, counselling and professional qualification. It therefore has to do with a local overall concept for ‘lifelong learning’<sup>12</sup>

Also, in the area of educational institutions, such as in schools, it is not enough to raise the climate change as a learning subject in lessons or in interdisciplinary teaching. What is required is a ‘whole institutional approach’. In the ‘Roadmap’ of the Global Action Programme ESD (GAP ESD), this is the second of the five priority action areas: ‘Transforming learning and training environments: Integrate sustainability principles into education and training settings’ (UNESCO 2014). In a comparable way, such a holistic approach is important for the local community level. This also corresponds to the purpose of the fifth priority action area of this roadmap: ‘Accelerating sustainable solutions at local level: At community level, scale up ESD programmes and multi-stakeholder ESD networks’. The term used in the German version, *Bildungslandschaft* (educational landscape), corresponds as far as the contents and the target is concerned approximately to the term *multi-stakeholder networks* in the English version. It is the networking and coordination of a local educational landscape that defines its special quality.<sup>13</sup> Unfortunately, most communities in Germany as well as presumably also in other countries of the world are nowhere near such local goals. There are, however, some positive exceptions on the level of some very small communities where the mayor and some committed citizens and associations have succeeded in this respect.

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12 The related literature is comprehensive and outside the scope of this article.

13 The author (Becker 2016) deals with this question in a more detailed manner under the aspect of ESD.

A major obstacle for the development of CCESD and regional educational landscapes is the COVID-19 crisis. Compared to the ‘Climate crisis’ (global warming), however, it may be regarded as a temporarily limited problem which strongly preoccupies mankind since the beginning of 2020. There are also connections between the causes of both crises that might be made subject of CCESD which shall not be considered further here (see e.g. UNESCO 2020).

### 3.1. Local educational landscapes – learning cities and regions

The background of the term local or communal educational landscapes in Germany originally had only little to do with ESD or CCESD. It deals rather with social problems and the role of schools and the following aims:

- Education as a central theme of community development
- Networks on the topic of education for the learning subject
- Connecting formal and non-formal education (especially for youth)
- Opening educational institutions in the city districts
- Utilizing preferably diverse educational opportunities
- Communal collective responsibility for education
- Cultural education in local educational landscapes

In 2007 and 2012, the German Association of Cities (*Deutscher Städtetag*) issued declarations on communal educational landscapes (DST 2007, 2012a). This Association started off from a holistic concept of education and stressed, ‘With their manifold institutions, cities and towns shape the local educational landscape of Germany: nurseries, family centres, institutions for child and youth work, schools, adult education centres and numerous cultural institutions are corner pillars of the public infrastructure of education’. Although in the meantime numerous publications appeared that are dedicated to this significant subject, only few of them relate to ESD or CCESD <sup>14</sup>

Also at international level, similar initiatives were developed under the term *learning cities*, organized by the Institute for Lifelong Learning of UNESCO – initially without any reference to ESD or CCESD. The second International Conference on Learning Cities was held in Mexico (UNESCO 2015) with a Statement on Sustainable Learning Cities. This orientation towards SD was expressed in an international workshop in December 2016 in Hamburg regarding the topic ‘Global Action Programme on Education for Sustainable Development and Cities’, in which many examples were presented and discussed.<sup>15</sup> In December 2020 a further conference was dedicated to the topic “Citizenship education at local level”<sup>16</sup>

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<sup>14</sup> <http://local.bne-literature.de>

<sup>15</sup> <http://www.uil.unesco.org/lifelong-learning/project/learning-live-sustainably-role-cities>. As a representative for the ESD City of Osnabrück, the author participated in this workshop, whose participants were mostly from Europe and North America.

<sup>16</sup> <https://uil.unesco.org/lifelong-learning/learning-cities/online-conference-strengthening-citizenship-education-local-level>

### **3.2. Local educational landscapes for sustainable development (ELSD) and CCESD,**

The idea of local ELSDs was born in Germany, more or less at the time of the *Aachen Declaration* (DST 2007). At the same time during the UN Decade of ESD, communities began to receive awards for their exemplary activities in the field of ESD. By the end of the UN Decade of ESD, 21 small and large communities had been awarded once or several times by the German Commission for UNESCO (DUK 2014). Some of these ESD cities understood their activities as processes for developing local ELSDs. This includes amongst others my home city of Osnabrück (see more in Becker 2016 and Sect. 4). Such ELSDs should either be a preferably integrative part of possibly already existing educational landscapes or be closely connected to local activities aiming towards sustainable city development either currently or in the future.

The local level is of utmost importance for successful climate policies (see Sect. 1.2 and 1.3.). Also here, it is a matter of linking as many actors as possible in a network, of cooperating with communal politicians and administrations as well as business enterprises that have a climate-friendly attitude, in short, a ‘landscape of climate actors’. This landscape should also include the respective educational activities in climate change, and therefore CCESD. In most German cities, such linking seems to unfortunately play a minor role, some positive examples in Sect. 3 and 4.

Through such linking, various community networks, synergy effects for climate protection, sustainable development, ESD and education in general and therefore also for CCESD can be achieved. Good results can be best achieved if scientists with a transdisciplinary mindset are engaged in the process. Furthermore, this also results in personal opportunities for the citizens, for example, in everyday life, professional qualifications and individual satisfaction (MK NRW 2015, p. 9). The practical barriers of such integrative approaches on the local level are mainly the result of the current conditions in most cities in Germany. These conditions include limited finances, strictly separated responsibilities and often a lack of interdisciplinary competences in the administration. In this article, most considerations for a local approach are not only valid for cities but for all municipalities as well. On one hand, the difficulties in implementing strong networking and cooperation in cities can grow with their size. On the other hand, bigger cities and especially those with an urban character offer a greater variety of actors and opportunities for implementation and engagement.

### **3.3. ‘Global’ CCESD: subjects, action areas and perspectives**

At the content level, there is a broad spectrum of actions and subject areas on climate change and the related perspective of SD for all educational fields – even for informal learning (see Sect. 2):

- Climate-friendly mobility, e.g. local/urban public transport, bicycle traffic, pedestrian flow, innovative traffic management, car sharing, climate-friendly holidays
- Climate-friendly construction and housing, e.g. building insulation, application of renewable energies, energy efficiency, energy counselling
- Climate-friendly conception of town planning, greening process of city areas, city nature, local recreation and leisure in city districts, ...

- Climate-friendly consumption, e.g. purchasing and using sustainable products and services (efficiency), sustainable disposal, ecologically fair procurement system
- Climate-friendly nutrition, e.g. fewer animal products, organic products, fresh, seasonal, regional products ...<sup>17</sup>

These subjects should always be approached with respect to the local/regional situation and possibly also in consideration of the global aspects, expressed in the newly created word ‘glocal’.

In addition to examining such topics, CCESD has to teach general basic knowledge on climate change and possible management strategies: climate research and the greenhouse effect (natural systems, local and global contexts, anthropogenic influences), history of energy, national and international climate policies, renewable energies and future technologies and climate fairness. CCESD will always have to relate to possible and necessary political, social and also cultural consequences – particularly on the local level. In so doing, CCESD will always be related to political, social and cultural education in the end. In any case, creative, target-group-related and diverse participatory offering about the relevant subjects should be developed and implemented and related as much as possible to the respective local situation and concrete everyday action. There is a wide range of tested methods and examples for practical implementation of climate education at school, vocational training, continuing education or studies.<sup>18</sup> The informal area of educational landscapes is also of major importance and includes the following formats:

- A different range of services for counselling (on changing behaviour, planning aids and an overview of possible subsidies)
- Conferences, workshops and expositions (for exchanging information amongst experts and providing information to the interested public),
- Regulars’ reserved tables at restaurants (German: *Stammtische*; as regular meetings for linking groups of actors)
- Public relation events and campaigns for initiating and anchoring the process of climate protection in the population, for reinforcing the atmosphere of change and the identification with the overall process.
- Cultural events during which measures of climate protection are practised and communicated or which use their profit for climate protection measures.
- And last but not least, central local websites which inform the public about activities and models of good practice.

The whole institutional approaches mentioned in this section are gaining a broader basis in local educational landscapes through cooperation and networking: In schools and other educational institutions, learners are getting significantly more as well as new opportunities to gain insights into

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<sup>17</sup> Possible references to the various educational areas can be found e.g. in MK NRW (2015, p. 12-13).

<sup>18</sup> A selection of German and English literature on CCESD can be found in the above-mentioned literature database BNELIT of the author.

everyday practice. In recent years, some publications related to this have been published: In a state-funded project, examples of experiences regarding cooperation between the local climate protection and local ESD actors were appraised and recommendations were formulated (ANU 2013). Another good example is the very successful practical guideline about ‘Education in communal climate protection’ (MK NRW 2015), which was developed by the Government of North Rhine-Westphalia in close cooperation with many interested actors in the field of education and climate protection and representatives of community administrations.<sup>19</sup> A positive example is the comprehensive concept developed by the city of Köln (Cologne) and its respective internet portal (<http://www.klimabildung-koeln.de>). It is interesting to note that the project was financed to a large part by Cologne’s municipal enterprises, which although certainly welcome, is certainly neither an ideal nor transferable solution (see Jantz 2016).

Since 2019, new social ‘future movements’ form part of the educational landscapes for climate change such as Fridays for Future, Scientists for Future, Teachers for Future, Parents for Future<sup>20</sup> and other groups<sup>21</sup> which – in addition to their climate political goals – also contribute significantly to a form of climate education that is action-oriented and mostly informal. Already numerous publications have been made on the world-wide movement F4F<sup>22</sup>. Furthermore, first empirical studies have already been made on climate change awareness, climate friendly behavior of students from secondary schools in the context of Fridays for Future and participatory CCESD (e.g. Deisenrieder et al. 2020).

### **3.4. Problems of local and regional CCESD**

Considering the abundance of crucial and challenging tasks that are nevertheless difficult to put into practice, we are faced with the problem of how they can be implemented in cities and other communities. Comprehensive and holistic local CCESD approaches in the outlined sense (Sects. 3.2/3.3) are apparently far from being implemented in a necessarily broader and long-term practice. This is the case even in those regions included in the present Masterplan 100% Climate Protection. The general political problem in Germany is that such CCESD approaches were not explicitly included in the previous state-funded programmes in Germany.

Behavioural changes in individual action areas, which can perhaps be achieved or promoted through climate education, will not suffice in the long run. Comprehensive forms of forgoing or frugality (sufficiency), namely, different lifestyles, will have to be developed and implemented by as many people as possible. Often, this is difficult to enforce in Germany and other industrialized countries and also constitutes a great challenge for practice-related CCESD on site.

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19 The basic ideas of this practical guide (40 pages), on which the author collaborated, largely agree with the argumentation in this article. The implementation possibilities and the content aspects are comprehensively presented in the guide.

20 <https://www.scientists4future.de>, GAIA 2019/2, <https://teachers4future.de>, <https://www.parentsforfuture.de>

21 [https://wiki.fridaysforfuture.is/index.php?title=For\\_Future\\_Bewegungen](https://wiki.fridaysforfuture.is/index.php?title=For_Future_Bewegungen)

22 See Burow 2020, Haunss/Sommer 2020, Wetzel 2019, Weusthoff von Kirchbach 2019

Kopatz (2016) explains in his book that the behaviour of all of us is more strongly influenced by established legal standards than by mere moral appeals. He would like to ‘change structures instead of persons’. This, however, is no alternative: both structures as well as persons must change. Without CCESD in a wider sense, there will be no real change in structures. Also, these new structures must be plausible for the citizens and the following generation if they are to function effectively. Naturally, this framework also includes climate-friendly economic policies and mobility policies at the national and local and/or regional level. Through clever measures, the climate-friendly action of citizens can be facilitated. This also concerns all administrations, enterprises, educational institutions, organizations and others which may improve the conditions for climate-friendly behaviour by appropriate measures in their fields of actions.

Nevertheless, it is difficult in many cases in our democratic society to come to any agreement at all regarding sensible political measures. In particular, politically influential economic interests often prevent, weaken or delay these measures, which will especially have dramatic consequences for the climate change. In addition, it would be a contradiction to democratic forms of education if the declared aim was a clearly determined correct type of behaviour in all fields of action. In most cases, there is no clear-cut correct behaviour anyway in this very complex social field, which does not imply any arbitrariness of action. Finally, even a successful and socially accepted CCESD will not be able to guarantee a sufficient change in the citizens’ behaviour. Even an acquired disposition for climate-friendly behaviour does not guarantee a practical implementation. It will be even less efficient when applied to many spheres of daily life and behaviour that are often characterized by old habits and convenience, emotions and many other factors.

However, there is reason to believe that the local approach of education in educational landscapes in cities and the link to possibilities for action on site increases the probability of diverse forms of practical action in favour of climate protection and a more efficient form of cooperation. Publishing works on practical successful approaches on site and engaging in practical cooperation may increase the motivation of individual actors and thus reinforce the positive effects overall.

#### **4. Example Network CCESD Region of Osnabrück – Regional Educational Landscape**

Normally, the creation of local educational landscapes for sustainable climate development is a long-term process. More than 30 years of experience in the process of developing and linking environmental education and ESD have shaped the strategy in Osnabrück. A first evaluation on climate development in Osnabrück was conducted as early as 1986. In 1994, the city of Osnabrück joined the international European Climate Alliance (see Sect. 1.2). Later, numerous initiatives and projects were developed with the aim of climate protection, as well as many other projects and initiatives which might be regarded as precursors to climate education. In 1993/1994 the *Association for Ecology and Environmental Education Osnabrück (AEEEO) - Verein für Ökologie und Umweltbildung Osnabrück e.V.*,<sup>23</sup> carried out the project “Energy saving” at six Osnabrück schools. More than 10 years later this

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<sup>23</sup> I am chairman of the AEEEO

association started a similar project ‘Educational Consulting on Energy Saving at Schools’ on behalf of the City of Osnabrück<sup>24</sup>, since then implemented with great success at nearly all schools in the City of Osnabrück and a similar project being carried out in the Osnabrück region<sup>25</sup>.

A new opportunity for developing an efficient CCESD was the ‘Theme Year 2017 Climate City Osnabrück’, that had offered unique and excellent opportunities to work towards the envisaged perspective of CCESD. At the same time, it significantly contributed to the overall educational landscape of Osnabrück as an example of an area of activity that is considered of great importance due to its thematic cross-sectional function – also for other communal fields of action (e.g. social, cultural, ...). If it succeeds, it might even assume a model function at the supra-regional level under the aspect of participatory, networked, communal climate policies oriented towards education.

The state of the development of the Osnabrück landscape for climate education for sustainable development described previously and its possible perspectives are shown simplified in the following figure: In the middle, one can see the primary actors of the Theme Year. On the outer edge, most of the other current or potential actors and groups of actors are shown. The arrows symbolize the current or potential interconnections among the actors or connections to a joint goal.

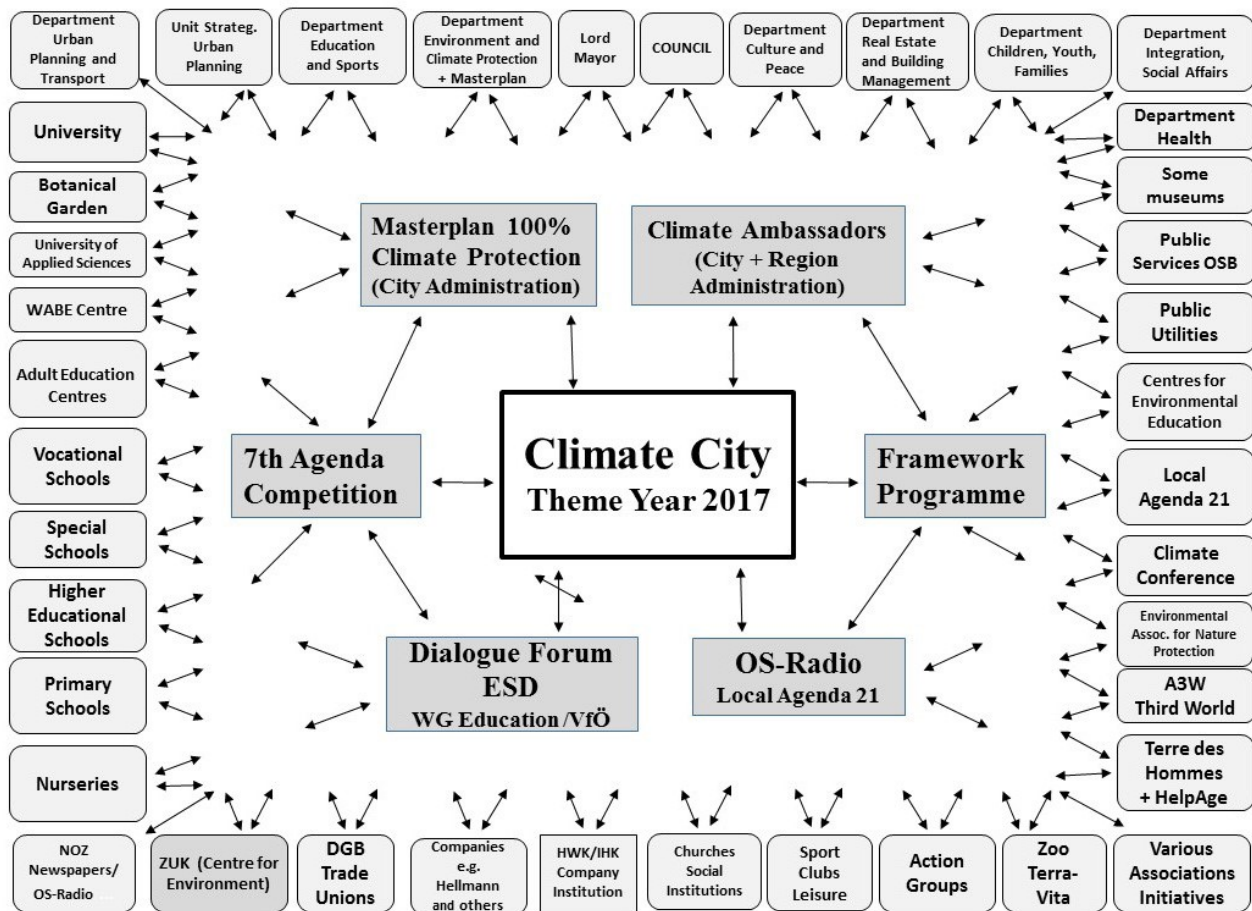


Fig. 2 G. Becker: Educational Landscape for Climate Change Education Osnabrück  
- Potential and Process 2013 – 2017.

24 [www.pe-os.de](http://www.pe-os.de) and since 2018 with a new sponsoring organisation <http://www.klimalab-os.net>

25 Becker 2021 (<https://www.bnc.uni-osnabrueck.de/Becker/Publikationen1> - open access)

There is still a very important potential for CCESD in the cooperation of the city and district of Osnabrück with the two neighbouring regions, the town of Rheine and the district of Steinfurt, which are also included as regions of Masterplan 100% Climate Protection. A conference (Climate Summit) was organized by the city of Osnabrück in Mai 2018 on the topic Climate Education for this large region where many regional actors presented their activities and projects. The AEEEEO that had recommended this conference as a contribution to regional networking some months before presented its initiative for a network Climate Education Region of Osnabrück at this Conference. **That same year**, this network could be started off with implementing some parts of the total concept.<sup>26</sup> So far, in their work for climate protection and climate education schools are to be supported in the following major fields (see Becker 2019c, Flack 2019):

- Climate Forum „Schools learn from other schools“ ([forum.klimabildung-os.de](http://forum.klimabildung-os.de)). The forum is organized at exemplary schools respectively. Participants are able to learn in real situations from their respective host school and develop ideas for their own practice. The documentation on the website will help to inform further and new interested persons and schools and widen the scope of the forum.
- Networking of non-formal climate actors as partners of schools. ([vernetzung.klimabildung-os.de](http://vernetzung.klimabildung-os.de)). This will considerably enhance the possibility to organize school climate projects in cooperation with non-formal partners and related to precise topics and locations of the region.

Due to Covid 19, the climate forum can only be carried out on-line, a fact that largely restricts its possibilities and prevents to make major use of the offers from the non-formal actors. Therefore, since 2021 we reinforced two forms of supporting the schools:

- Sending out newsletters [newsletter.klimabildung-os.de](http://newsletter.klimabildung-os.de)
- Presentation of selected schools under the aspect of CCESD [schulen.klimabildung-os.de](http://schulen.klimabildung-os.de)

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<sup>26</sup> see <https://www.bne.uni-osnabrueck.de/Klimastadt/Klimagipfel2018> und <https://www.bne.uni-osnabrueck.de/Klimastadt/NetzwerkKlimabildung>



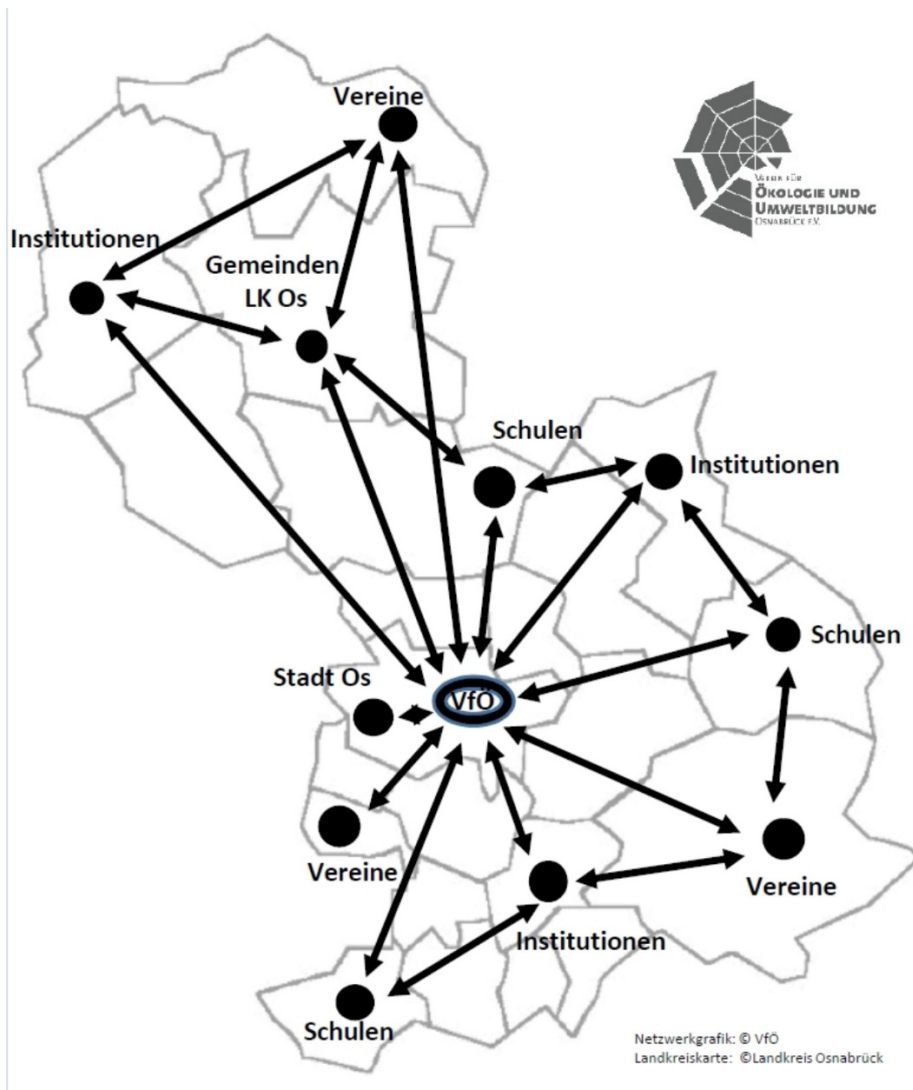


Fig. 3 Symbolic Graphic and Logo of the Network CCESD Region Osnabrück

Of course there are many more players in the field of climate education to be found in other formal, non-formal and informal education areas in the region of Osnabrück that are to be integrated into a future landscape for climate education for sustainable development. Especially worth mentioning here are the new social 'future movements' Fridays for Future, Scientists for Future, Parents for Future, Psychologists for Future<sup>27</sup> also active in Osnabrück since 2019 and other groups that contribute in a significant manner to a form of climate education that is action-oriented and mostly informal. Since 2019, S4F Osnabrück e.g. organizes a series of lectures on the subject Climate Change & Climate Protection which since October 2020 have to be organized in form of video conferences due to Corona.<sup>28</sup> F4F is primarily committed at political level and very successful in its work in this field whereas as far as I know the actors show significantly less commitment in the area of their own schools. There is still a lot of potential for promoting CCESD and for standing up for

<sup>27</sup> <https://www.os-scientists4future.de>, <https://osnabrueck.parentsforfuture.de>, <https://www.psychologistsforfuture.org...>

<sup>28</sup> Included here a lecture of mine on the subject of this chapter (<https://youtu.be/KMB7onruKx8>) and more in: <http://vortraege.klimabildung-os.de>

climate-friendly schools. So far, all efforts of support, networking and organization of climate education were mainly supported by temporary promotional funding and personal commitment. For the necessary organization of these measures at a long-term base and their extension to the total educational landscape of Osnabrück region, a close cooperation with the local government of the City of Osnabrück and the rural district is required, assuming that corresponding political decisions are made and sufficient financial and personal resources granted.

## **5. Climate Change Education in other Cities of Germany**

*The Partner Network ESD Communities* in Germany comprises a cooperation of all municipalities that received an award by the German UNESCO-Commission for ESD. As a scientist with long-term experience in this field, I have been representing the City of Osnabrück in this network at voluntary basis since 2013. In 2018/19 I carried out a written survey with all these municipalities, at that time a total of 25 approx., the contents of which had been discussed previously and afterwards at network meetings. Whilst the 10 cities and towns of Freiburg, Gelsenkirchen, Heidelberg, Hamburg, Frankfurt, Erfurt, Osnabrück, Köln, Bad Honnef and Neumarkt participated in this survey with detailed information, no rural district was involved in the network so far with the exception of some smaller communities from some districts.<sup>29</sup>

These 10 municipalities show in an exemplary manner the different ways of anchoring climate education for sustainable development within the community and link it to climate policy in a systematic manner. Here, it appears that in none of the selected municipalities climate education is understood as a mere instrument of climate policy which in any case would contradict the educational principle of man's right of self-determination. Some municipalities already succeeded in building up good structures within their administration in order to meet the challenges and secure progress on a long-term basis. In other cases necessary services are taken over to a larger extent by institutions and organizations outside the administration on behalf of the community. To a different degree, subtasks, in particular initiatives for new tasks are assumed at voluntary basis. When taking a closer look at the public internet presentation of activities in the field of climate education and BNE strong differences will appear on the websites: Is it easy to trace the total of activities and information in the field of climate education and BNE – possibly by their proper web addresses? Is the presentation transparent and complete? Are there adequate links between the respective coherent fields of action, i.e. between activities in the field of climate protection, climate education, BNE/Global Learning, general educational landscapes?

A major concern for all these municipalities are the financial resources and the necessary professional competences, in particular interdisciplinary and interdivisional ones that need to be provided for a permanent establishment of work, ultimately by political decisions. Although frequent project funding by foundations sets many useful impetus and facilitates temporary testing of ideas it will hardly lead to the creation of long-term structures. Finance, sometimes granted by business enterprises does not ensure the continuity of work in the long run.

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29 Summarized presentation of the results in: Becker 2020a, Chap. 3.8.1-3.8.10

Successful policy of climate education as part of sustainable community development requires good cooperation and transparency amongst the different administrative sections and actors as well as public visibility and communication which in regional practice is still hard to be found. .

## 6. General Conclusions

This article has shown that climate change education for sustainable development (CCESD) can make a necessary and important contribution towards addressing the climate crisis in terms of climate change mitigation and adaptation. The prerequisite is local or regional educational landscapes that are closely linked to climate-relevant activities from local politics, civil society and also the economy. However, it is also apparent that CCESD is still very much at a beginning stage due to myriad reasons and has its limits under the current socio-political conditions. To promote these local and regional perspectives, especially in the urban sphere, additional changes are required in climate and educational policies at the various levels. At the same time, it is important for the actors to exchange information on the local, national and international levels, which in turn should improve the local approaches, further developing them and spreading them to new municipalities. Furthermore, climate science or sustainability science needs to assume a transdisciplinary perspective in the future to support and stimulate the field: Knowledge from education, environmental psychology and environmental economics all play a vital role. Future research projects to study the specific urban and regional educational landscapes with respect to future climate cities are of great importance.

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## Biographical Note

Since 1973, Dr Gerhard Becker has been working at the University of Osnabrück as a lecturer and researcher. Since about 1978 he increasingly dedicated his work to environmental education. Since about 1993, ESD was coined as the new central idea and subject in university teaching, research and practical projects as well as cooperative efforts of networking, mostly in Osnabrück. A central role was played by the *Verein für Ökologie und Umweltbildung Osnabrück e.V.* (Association for Ecology and Environmental Education Osnabrück; AEEEO) - a cooperative institution of the University of Osnabrück. Since his retirement, his academic work has been continued in a reinforced manner under

the name *Umweltbildung für nachhaltige Entwicklung* (UBINOS) (Environmental Education for SD) at the university in the form of practical projects from the association as well as in the Educational Landscape of ESD of Osnabrück. As a result of his academic activities and of many continuous practical projects originating outside the university, there are more than 160 publications. A selection of present functions: Chairman of the Association, Speaker of WG ESD of the Local Agenda 21, Member of the national working group 'Communities and ESD', member of the commission 'ESD' of the German Education Research Association (GERA), Project Head for the Online Literature Database BNELIT ([www.bne-literatur.de](http://www.bne-literatur.de)) and the Network Climate Change Education Osnabrück ([www.klimabildung-os.de](http://www.klimabildung-os.de))

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