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Article

Transforming Well-Being in Wuppertal—Conditions and Constraints

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Abstract: Conventional welfare production is unsustainable. A societal emphasis on (green) economic growth may therefore be superseded by an extended concept of well-being. Taking a transformative approach, science may take part in catalysing this challenging transformation of both the understanding and the level of well-being. Instead of economic growth at the expense of sustainability, we aim to cooperatively refocus on integrating economic, social and ecological perspectives into a more holistic, sustainable approach to individual and municipal well-being in Wuppertal (Germany). Therefore, the research team investigates and develops concepts of local sustainable well-being production, e.g., by employing a new indicator system and the real-world laboratory approach. What are the conditions and constraints of transforming well-being in Wuppertal and most particularly of the role of scientists in this endeavour? Answering this research question with a comparative case study approach, we have analysed our resources, processes, contexts and normativity. The results show that the role of ‘transformative scientists’ in Wuppertal faces constraints of timing and funding, as well as challenges from the different demands of science and practice. Hampered co-design interacts with role conflicts. Open-minded stakeholders are crucial for local well-being transformation, as is the awareness that urban residential districts have bottomed out. However, the normative sustainability claims of the transformative research project are not fully shared by all of its stakeholders, which is both necessary and challenging for transformative research.

Keywords: sustainable urban development; well-being indicators; real-world laboratories; transformative research; transdisciplinarity; well-being; beyond GDP; roles of scientists; city districts; civic participation

1. Introduction

As is widely recognised, economic welfare production as put forth by the industrial age is unsustainable. However, even an economic welfare production that does try to minimise the consumption of natural resources still does not fully meet the requirements of a comprehensive sustainable development. From this perspective, a one-sided societal emphasis on (green) economic growth may be superseded by an extended concept of well-being. Science may take part in catalysing this challenging transformation.

Employing a transformative approach as scientists, we research and support the transformation of both the understanding and the level of well-being. Leaving behind concepts of welfare which focus on economic growth at the expense of sustainability, we aim to cooperatively refocus on integrating economic, social and ecological perspectives into a more holistic, sustainable approach to individual and municipal well-being in Wuppertal (Germany). Therefore, the research team investigates and develops concepts of local sustainable well-being production, maps relevant civil society initiatives, develops an indicator system on a participatory basis for measuring sustainable well-being in Wuppertal and provides scientific back-up for so-called Real-World Laboratories (RWLs).

What are the conditions and constraints of transforming well-being in Wuppertal and most particularly of the role of scientists in this endeavour? The ambitious approach on transforming well-being in Wuppertal (Germany) presents us with various challenges and opportunities: Concerning our purpose of well-being transformation, the city of Wuppertal is an interesting case, for it is still undergoing wide structural change and struggling with scarce municipal resources, thus allowing considerable room for civic involvement. Moreover, connecting citywide indicator development with specialised RWLs in city districts to jointly provide a new well-being orientation, is untested in sustainability science so far. For our article's research on conditions and constraints of local well-being transformation and particularly of the role of scientists therein, we can draw on findings of literature on transdisciplinary processes and local sustainability transitions. Nevertheless, our research approach deviates, at least in part, from typical settings in these areas. This is mainly due to the explicitly transformative approach, which still lacks dedicated empirical research in transformative science regarding its implications for research practice.

2. Theoretical Background

To analyse and promote well-being transformation in Wuppertal, we primarily draw on concepts of transdisciplinarity, connecting to the debates on transformative science, local sustainability transition, real-world laboratories and well-being. The theoretical background provided below will guide our reflection on conditions and constraints.

2.1. Transdisciplinary Research

Various complex challenges and questions cannot be answered adequately with classical scientific methods, within disciplinary boundaries or even with interdisciplinary approaches. Against this background, alternative methods of scientific knowledge production have been developed since the 1970s ([1] p. 527). Initially introduced as a term for deepened interdisciplinarity in the 1970s, since the end of the 1990s the notion of transdisciplinarity is used to describe a research approach which includes non-scientific actors into the research process for the purpose of *knowledge integration* ([2] p. 2ff.), [3], ([4] p. 2), ([5] pp. 95–99). Transdisciplinary research aims to deal with complex problems, creating *socially robust knowledge* [6] and sustainable solutions to *real-world problems* [7] while simultaneously generating new scientific knowledge [1,8–10]. Transdisciplinary approaches are especially dominant in *sustainability research* ([11] p. 420), ([10] pp. 563–564). Particularly noteworthy are the transdisciplinary case studies by ETH Zurich since the 1990s and the studies by the Institute for Social-Ecological Research (ISOE), that also developed a model of an ideal transdisciplinary process [12,13].

In transdisciplinary research, scientists from different disciplines work together with practitioners in order to integrate different forms of knowledge. The co-led transdisciplinary process is characterised by *mutual learning* [14] and *mutual understanding* between stakeholders and scientists [1,8,10]. At the *co-design* stage, a common understanding of the problem is generated and system boundaries are defined. This phase is followed by the *co-production* and *dissemination of knowledge* [1].

Several *key conditions* for successful transdisciplinary processes are repeatedly mentioned in the literature. One main challenge is gaining not only agreement on the *roles* of the various participants but also willingness on the part of participants to reflect on and, if necessary, adapt these roles ([9] pp. 664–665), ([11] p. 429). Scientists often act both as researchers and as facilitators of the transdisciplinary process, especially if no additional facilitator is involved ([9] pp. 665, 668), [15]. Regarding the transdisciplinary process, science-practice *co-leadership* facilitates the definition and acceptance of responsibilities and benefits of all the actors involved [16]. Co-leadership may also manifest itself spatially in having an office as a permanent contact points for all involved stakeholders ([17] p. 74).

Regular and open *dialogue* and a *common language* between the participants in the transdisciplinary process, are another key to success. A *protected discourse arena*, where participants can share ideas and knowledge, must be established ([9] p. 659). Moreover, to make mutual learning and understanding possible, all participants have to be *open to new knowledge* [9].

Another success factor in transdisciplinary processes is the *transparent distribution of financial resources* ([9] p. 658). Both Mauser et al. and Scholz and Steiner also mention the importance of *institutional support*. Mauser et al. argue that institutions are often not suited for transdisciplinary research and need to be adapted ([9] pp. 656, 664), ([11] pp. 428–429).

2.2. Transformative Science

Employing a transdisciplinary research approach is also a central demand of transformative scientists ([18] p. 46). Several authors argue that the traditional science system is not able to deal with contemporary environmental and social challenges and innovations, e.g., Tàbera [19]. A paradigm shift and a better alliance between science and society are necessary to deal with enormous alterations such as climate change. Transformative science, as one stream of sustainability science, is mentioned as a possible answer to these challenges ([20] p. 8). Schneidewind et al. describe it as “a specific type of science that does not only observe and describe societal transformation processes but rather initiates and catalyses them. Transformative science aims to improve our understanding of transformation processes and to simultaneously increase societal capacity to reflect on them” ([20] p. 6).

While this concept of transformative science has mainly been discussed in German-speaking countries, it is closely connected to broader methodological debates on urban sustainability and transdisciplinary approaches, as well as to the European debate on ‘Responsible Research and Innovation’ ([20] p. 8), [21]. In contrast to the German-speaking and European discussion, the US National Science Foundation has a different, far narrower understanding of transformative science ([20] p. 8), [22]. In addition, there are international academic and political discussions on the role of science and research institutions for sustainability transformations. These are evident in various drafts and position papers on higher education institutions [23] and in the establishment of the Higher Education Sustainability Initiative [24].

Accompanying and supporting processes of sustainability transformation, transformative science makes explicitly *normative demands* by promoting the goal of sustainable development [18,25]. Furthermore, it aims to generate different *forms of knowledge*: systems knowledge, target knowledge and transformation knowledge. In their definition of the concept of transformative science, Schneidewind and Singer-Brodowski ([18] p. 46) refer to Scholz ([26] p. 394) and call for “disciplined interdisciplinarity in transdisciplinary processes.” Developing the concepts of Gibbons [27] and Sterling [28], they understand transformative science as *mode three science* and third-order learning (aka epistemic learning). Here (mode three), not only is science more reflexive and adapted to the context in which it operates (mode two) but routines and paradigms are also questioned, as well as the way of learning and thinking and changes happen on the institutional level. Mode two and three science will not replace classical mode one science but complement fundamental research ([18] p. 81), [28]. Moreover, it should be noted that other authors only differentiate modes one and two [27,29].

However, the concept of transformative science is also subject to *critique*. Strohschneider especially criticises that conflicts of values and norms cannot be decided scientifically. According to him, the autonomy of science is at stake, as far as the code of science—true vs. not true—is being dominated by the normativity of the code of sustainability in transformative science, which is said to recourse to sustainability as an ultimate value ([30] pp. 181f., 186). In addition, he criticises the focus of transformative science on being actively involved in sustainability transformations, which would produce an *excessive demand* on science ([30] p. 186).

2.3. Local Sustainability Transition

In the discourse on sustainable development, municipalities have been seen as major arenas of sustainability transition from the very beginning [31]. In Chapter 28 of Agenda 21, the critical role of municipalities as “the level of governance closest to the people” is highlighted, since “so many of the problems and solutions being addressed by Agenda 21 have their roots in local activities” ([31] ch. 28.1).

Today, most of the world's population lives in cities and the proportion is rising. So, local and especially urban transition is still a top issue on political and research agendas, as is evident in the latest Flagship Report by the German Advisory Council on Global Change (WBGU) within the framework of Habitat III [32]. Here, science is called upon to engage in transformation research and transformative research on sustainable urban development, cooperating with citizens, local authorities and local business. As focal points of this research, WBGU ([32] ch. 10) recommends the sustaining of natural life-support systems; substantive economic and political inclusion (referring, *inter alia*, to alternative well-being measures); polycentric governance in, of and by the cities; and the so-called *Eigenart* dimension emphasising the heterogeneous, creative and context-specific pathways of local sustainability transformations. To research such individuality, WBGU promotes the transdisciplinary collaboration of academics and local actors in so-called 'urban RWLs' and 'real-life experiments', see also [33,34].

Additional related forms of science-practice collaboration have been tested in the Netherlands, especially in '*transition management*' [35,36]. The approach employs various *empowering mechanisms* to address the challenges of transition, elucidating the complexity of the issue, connecting change agents and generating common societal learning. The roles and relations of participants also come under scrutiny [37].

In order to identify relevant framework conditions, most of these approaches employ systems analysis from the start, defining system boundaries in terms of theme(s), time and space and identifying main properties, innovative actors, problems, developments over time and interactions within the system [38].

Building upon this approach, other scholars have developed so-called '*urban transition labs*' [39]. In these labs, several *challenges* have been identified, including: (a) the introduction of hard-to-measure elements, as well as the necessity of a willingness for continuous reflection, re-orientation and re-design; (b) working without tangible results for a certain time (e.g., building a common understanding and trust), while keeping voluntarily engaged members interested and motivated; (c) overcoming participants' mind sets of 'stakes' and 'representation' with a mind-set of personal engagement for a common good; and (d) coping with data gaps, uncertainty and scarce resources [39]. Urban transition labs have been supplemented with so-called '*urban living labs*'—a broader, less determinate experimental approach to urban sustainability governance [40].

Independently of the forms and concepts of local sustainability transitions, McCormic et al. [41] identify two *key processes* or drivers and two *key structures* regarded by many scholars as crucial to sustainable urban transformation. The two processes are 'governance and planning' and 'collaboration and learning'; the two structures are 'infrastructure and resilience' and 'buildings and precincts'.

2.4. Real-World Laboratories and Action Research

A *real-world laboratory* (RWL) is a transformative research approach. Scientists and practice partners, in transdisciplinary collaboration, engage with a certain real-world problem by utilising co-design, co-production and co-evaluation in demarcated time and space in order to lastingly contribute to sustainable development. This research practice is characterised by real-world interventions and cyclical learning processes through reflection and variation. It aims to produce mostly contextualised systems, target and transformation knowledge as well as to build capacities and to empower change agents. A particular challenge for RWL scientists are conflicting role expectations [34]. As RWLs are comprehensively discussed by Wanner et al. [34], we refer to their article for further details.

Roles are also reflected in *action research*. Action research is one of the approaches RWLs draw upon in addition to transformative and transdisciplinary research and different urban transition approaches (e.g., transition management). Originally dating back to Kurt Lewin, action research is highly participative in nature and aims for direct practical outcomes, i.e., helping people and communities by fostering change for a better life [42–44]. In its familiar version 'participatory action

research' (PAR), a largely constructivist and democratic approach is employed. Here, action researchers understand knowledge as being influenced by power relations and thus aim to empower marginalised groups [25,34,43,45]. Argyris and Schön stress the *challenge* of overcoming the *trade-off* between practical relevance and scientific rigour in PAR [46]. This trade-off also influences the difficult selection of roles researchers may take in action-oriented research approaches. Wittmayer and Schöpke propose five *ideal roles* for this purpose: change agent, knowledge broker, reflective scientist, self-reflexive scientist and process facilitator [47].

2.5. Well-Being Transformation

According to many authors, we need a different definition of individual and societal well-being, which is closely related to sustainability transformations. Only this will enable an *absolute decoupling* of resource consumption and quality of life ([48] p. 45), ([49] p. 73).

Since the 1960s, many scientists, politicians and civil society organisations have been criticising GDP as an indicator for quality of life in a society and have recommended the development of alternative concepts of well-being and appropriate ways to measure it [50–53]. For an overview on alternatives to GDP see also Schepelmann et al. [54]. In the past decades, many alternative definitions were formulated and many different terms used, such as quality of life, well-being, better-life or good life [55–62]. All these concepts have in common, that they understand well-being as something *multidimensional*, which cannot be described by measuring only material conditions. The development of alternative well-being definitions is partly overlapping with the development of sustainability concepts and indicators in the context of local agenda 21 processes [60,63–67].

The *capabilities approach* by Amartya Sen as well as the *fundamental human needs approach* by Max-Neef et al. both understand well-being not only as multidimensional but also as contextual. What people do to satisfy their basic needs ([55] p. 16), or which capabilities and functionings are necessary for a high quality of life ([68] pp. 357–362), depend upon the specific context and the society.

Well-being transformation, consequently, is very contextual and there is no path to well-being transformation suitable for every society ([32] p. 39). *By well-being transformation we mean two processes; firstly, the increase in the quality of life which is not at the expense of sustainability dimensions [48] and secondly, a change in the understanding of well-being, away from a mainly material to a multidimensional understanding.* This multidimensionality can allow political decisions to be no longer driven primarily by economic reasons but also considering other dimensions of well-being. Consequently, well-being transformation can be both, a change in the *understanding* of well-being and a change in the level of well-being. It thereby contributes to the Great Transformation as advocated by WBGU [69].

To scientifically analyse the level of well-being and changes of it, indicators for well-being are necessary. Since the beginning of GDP-critique, different indicator sets have been developed, measuring well-being, better life or sustainability on different levels, such as nation states, regions or cities [60,70–73]. A multidimensional concept of well-being requires multidimensional indicators and because the exact definition depends on the context, the indicators have to be adapted to each context as well. However, the selection of indicators is always, at least in part, a normative decision ([74] p. 404) and should, therefore, be transparent ([75] p. 7). In addition to scientists, different actors, such as stakeholders and citizens, should be involved in the selection process, to decide what is important for well-being ([75] p. 7), ([76] p. 304), ([77] pp. 65–66).

3. Case, Research Design, Methods and Data

After we have introduced the concepts we draw on in our research, we present our case, research design, methods and data. In the first section, we describe the development of the city of Wuppertal and selected city districts. Afterwards we briefly present the project's overall research design, including our transformative research activities. However, only the research design of our genuine research presented in this article, i.e., on the conditions and constraints of transforming well-being in Wuppertal,

is being described in more detail. In the subsequent section, we present our methods and data. For background information on related research, we refer the reader to Appendixs A–E.

3.1. Wuppertal and Selected City Districts

During the 18th and 19th centuries, the towns of Elberfeld and Barmen (amalgamated since 1929 into the City of Wuppertal) formed one of Germany's largest industrial centres. Awarded the right to bleach yarn in 1527, the city developed a thriving textile industry which boosted its population and size. At that time, Wuppertal was a pioneering centre of innovation and industry in Germany, providing jobs for many but simultaneously confronted with early social problems of inequality and working-class poverty. The population grew faster than houses could be built, a problem having been remained unresolved for a long time [78]. With workers' movements as important societal players, the history of Wuppertal was characterised by social innovation and a plurality of lifestyles and opinions ([79] p. 39). From the beginning of the 19th century onwards, further associations founded by civil society groups played an important part in municipal decision-making ([80] pp. 109–113).

Since the early 1980s, however, due especially to structural changes in the economy, Wuppertal has experienced a massive decline in population, with numbers dropping from 423,000 in 1963 to less than 348,000 in 2011 ([79] p. 34), [81]. Between 1970 and 1987, paralleling developments in other former industrial cities in the region, employment fell by almost 16% ([82] p. 83).

From 2011 to the time of writing, population numbers stabilised and even started to rise again to 355,000 in 2015 [83]. This is also due to inward migration from Europe and elsewhere to Wuppertal [84]. Wuppertal has a very heterogeneous population with 17% non-German citizens [83] and 35% of the population with a background of migration [84]. However, the city is not only heterogeneous in terms of ethnicities and religions but also in its spatial pattern, with high differences between different areas in unemployment rates and average incomes ([79] p. 36).

Wuppertal is struggling with a high level of untenanted apartments and business premises. In 2013 6.6% of flats in the city (12,950 units) were untenanted ([84] p. 4). And although unemployment rates in Wuppertal have declined in recent years—from 12% in 2012 to 9.6% in 2015—they are still high compared to other German cities [84]. The city is also struggling with high public debt, €1.9 billion in 2015, compared to €540 million in its larger neighbouring city, Düsseldorf [81]. The municipality is consequently very restricted in its ability to finance urban development. Support in this area has been forthcoming from several EU programmes, as well as from federal German and North Rhine-Westphalian state funds (e.g., 'Soziale Stadt'). Nevertheless, Wuppertal is a dynamic city with an active urban society with a tradition of participation and civil associations dating from the 19th century.

Three city areas are of particular interest, as they host our real-world laboratories (RWLs). The first one is *Oberbarmen & Wichlinghausen* in the eastern part of the city. United in a single Social City support programme, *Oberbarmen & Wichlinghausen* are actually two separate districts. Formerly important for the textile industry, the area is today densely populated especially with new immigrants and has a high proportion of non-German citizens. Both districts are characterised by loss of local stores, vacant accommodation and many betting shops. Especially *Oberbarmen* is known for its social flashpoints [85,86].

Industrialised in the 19th century, the *Arrenberg district* of Wuppertal near the city centre had been a centre of the textile industry from the 16th century. In the wake of major structural change, most factories had to close down in the 1970s and the working-class population rapidly pauperised. The number of inhabitants has been declining since the 1990s. Today, the district is still characterised by the coexistence of industrial buildings and old and new residential buildings. It was part of the urban development programme *Stadtumbau West* in the 2000s and is still home to several large companies ([87] pp. 156–190).

Like *Arrenberg*, the *Mirke district* in the northern part of Wuppertal has a heterogeneous population, 50% having a migration background [88]. This district, too, has an industrial history and still has several active manufacturing enterprises but it only emerged in the second half of the 19th century in the process of city enlargement.

3.2. Transformative Research Design

Together with our colleagues and practice partners, we aim to transform both the understanding and the level of well-being in Wuppertal towards a multi-dimensional, sustainable well-being orientation. We do this in several ways:

- (1) *Conceptualisation and measurement of the new well-being* by developing an indicator system. It is intended to measure overall progress or regress in different well-being dimensions. By providing dimensions and numbers, we expect that the indicator system also supports the mind shift of local politicians and citizens from economic growth to sustainable well-being when it comes to promoting certain policies (Appendix A).
- (2) *To facilitate the use of the well-being concept and indicator system by politicians and citizens*, we promote the indicator system as a management tool to estimate the contribution of different municipal and civil society projects to local well-being ([89], Appendix B).
- (3) *To spread the extended understanding of well-being among citizens and to gain data on subjective well-being* of Wuppertal's citizens in different places and situations, the research team cooperates with the Happiness Research Organisation in developing and applying the mobile phone app "Happy Wuppertal" ([90,91], Appendix C).
- (4) *To network Wuppertal's civil society initiatives* that contribute to well-being, we mapped these civil society initiatives and surveyed their stated problems as well as contributions to the well-being dimension. To make this knowledge available, the research team joined forces with other local mapping initiatives and a group of 'hacktivists' to set up a transdisciplinary process of developing a suitable public online platform (Appendix D).
- (5) *To research and support local well-being transformation in different dimensions in detail*, we established *three real-world laboratories* (RWLs) in the city areas mentioned above. The *Oberbarmen & Wichlinghausen* RWL focuses on vacant apartments in this area and aims to create solutions to care for them with the help of tenants who pay below standard but maintain the facility (*Haushüten*). The *Arrenberg* RWL focuses on the *Essbarer Arrenberg* (Edible Arrenberg) group, a subgroup of *Aufbruch am Arrenberg* (Arrenberg Starts Out), a young civil society organisation aiming to achieve a climate-neutral urban district. *Essbarer Arrenberg* promotes sustainable, local nutrition for the *Arrenberg* district through urban farming, food-sharing and restaurant days. The researcher inter alia supports the development of a local nutrition strategy. In the *Mirke* RWL, a forum that aims to integrate all relevant civil and municipal stakeholders of district development for the purpose of local well-being transformation is supported (*Forum:Mirke*) and the inhabitants' self-efficacy is researched. We also made steps to evaluate the RWLs contributions to the well-being dimensions (Appendix E).
- (6) Finally, we research several cross-cutting issues on a meta-level, *reflecting the research approaches* we use and the roles we take as scientists in this transformative research project, inter alia. The present article is part of this cross-cutting research and focuses only the *conditions and constraints of transforming well-being in Wuppertal and most particularly of the roles of scientists in this endeavour*. Here, we focus on the causally more distant framework conditions to the outcome of well-being transformation, which we are already able to identify. Regarding the RWLs, this research is comparative in nature, for there are several comparable components, like characteristics of city districts and research phases, which may help to understand which conditions and constraints interact with each other. A facilitating condition might lose relevance or become a constraint in a different context and vice versa and if a condition seems to be relevant in all three cases, one could conclude tentatively that this one might be also important in other cases with similar contexts.

What aspects should guide our analysis? The following *perspectives of inquiry and reflection* are gained from conditions and challenges mentioned in the theoretical considerations of Section 2.

Studies on transdisciplinarity [9,10,15], action research and transition management [37,47] and RWLs [34] stress the challenge of *defining and delimiting the roles* of both scientists and practitioners in transdisciplinary processes. Furthermore, the *expertise, motivation and open-mindedness* of the parties involved must be taken into consideration, as is emphasised especially in transdisciplinarity and urban transition labs [9,39]. These aspects play a major role in *collaboration and learning*, which are seen as pivotal for advancing sustainable local transformation [32,38]. Scholz and Steiner [9], as well as Nevens et al. [39], regard *time* and *financial resources* as important boundary conditions for transdisciplinary processes or transformative projects, respectively. True *co-design, co-production* and the creation of *protected discourse arenas* are further aspects repeatedly mentioned as influencing factors for successful transdisciplinary processes, including the make-up of *transdisciplinary teams, co-leadership, mutual understanding and learning* and the development of a *common language and common objectives* [9,11,15,16]. Various authors in the field of urban sustainability studies highlight the importance of the specific transformation potential of *cities and districts*, where *history, actors and economic and social conditions*, as well as dominant *narratives*, may be key factors [32,38]. Another important framework condition that can enable or hamper transformative and transdisciplinary research projects is the *institutional context* in which the research is carried out [11,18]. Finally, in transformative and action-oriented research activities, the *normativity* of the approach must be considered [18,25,30,34,45].

The following Table 1 summarises these *perspectives of inquiry and reflection*, by which we mean the aspects that will guide our description and analysis of framework conditions.

Table 1. Perspectives of Inquiry and Reflection (Own compilation).

Contexts	City and districts (challenges, actors, projects, narratives), institutions
Staff & Resources	Roles, expertise, motivation/openness, funding
Processes	Time frames, discourse arenas, co-design, co-production
Normativity	Goal of well-being transformation

3.3. Methods and Data

Methods and data for the overall project of transforming well-being in Wuppertal (Paragraphs 1 to 5 of Section 3.2) are presented in the respective Appendixs A–E. For examining framework conditions for transforming well-being in Wuppertal and the three researched city districts, we draw on various intermediate results and different data sources, analysing both secondary data like municipal statistics and reports and primary data collected by ourselves through interviews. We use results from short telephone interviews with 44 representatives of civil society organisations, referring especially to the stated challenges of their work in Wuppertal. The interview partners were selected through the snowball method (Appendix D).

Moreover, we conducted 19 additional, semi-structured expert interviews. Here, we interviewed the project's senior scientists (i.e., (sub)project leaders), the junior scientists working in RWLs and RWL practice partners. We asked them to share their knowledge and experience of and perspectives on, the transdisciplinary collaboration and, where applicable, the respective city district's image, identity, and success conditions regarding local well-being transformation. In detail, the interview guidelines included questions on the initial co-design phase, the interviewee's roles and interests, science-practice interactions, the current state of the respective subproject, problems, and preliminary learning outcomes. The face-to-face interviews were conducted between May and July 2016, taking between one and three hours each. To ensure the quality of the interviews and of their analysis, two of the authors of this article jointly conducted each interview and none of the authors was an interviewee in this interview series. Like some of the interviewees, the interviewers are junior scientists working in the research project on well-being transformation Wuppertal as well. However, they work on overarching work packages, which allows them to keep a healthy minimum distance to both the RWLs and the indicator development. The interviews were recorded and transcribed to enable their analysis

according to the key perspectives indicated above, leaving room for inductively gained insights that were not captured by the pre-developed codes. The interviews were analysed partly with the software MAXQDA Plus 12 (Release 12.3.2., VERBI GmbH, Berlin, Germany) and partly in a research pragmatic way by marking and comparing key statements in the interviewees' answers, bearing the guiding aspects in mind. To safeguard anonymity, we do not cite interviewees by name here. Therefore, although large parts of the following sections draw on our interview material, especially with regard to RWLs, we make no explicit reference to the interview source to prevent inferences on the interviewees' identities.

4. Interim Results

4.1. Conceptualising, Measuring and Transforming Well-Being in Wuppertal

The interim results of conceptualising, measuring and transforming well-being in Wuppertal (see Paragraphs 1 to 5 of Section 3.2), as far as available and publishable, are presented in the Appendixes A–E. To facilitate the reader's understanding of how we conceptualise well-being, the preliminary result of the selection of well-being dimensions is provided in Figure 1 below.



Figure 1. Dimensions of Well-Being in Wuppertal (Own illustration).

4.2. Framework Conditions of Transforming Well-Being in Wuppertal

4.2.1. Contexts

As already observed, Wuppertal has been in a difficult economic situation for decades (see Section 3.1). According to several people, this shortfall in municipal resources motivated them to become actively involved in civil society projects and initiatives. Many of Wuppertal's civic groups are very active today at both municipal and district levels and are well connected with each other (see telephone interviews December 2015–April 2016). The representatives of civil society organisations mentioned several problems they are dealing with in the context of their, mainly voluntary, work. Especially increasing social problems, poverty and segregation between different population groups along lines of class and ethnicity are mentioned repeatedly. Also, deficits in education, a lack of leisure opportunities for youth in several districts and a simultaneous increase in migration on the one hand and extreme right-wing positions on the other are mentioned in several interviews. In addition,

the interviewees bring up the high vacancy rates, the shabby townscape and the rather poor image of the city. Furthermore, problems in the cooperation with city officials are reported occasionally.

These challenges are for the most part reflected at the *district level*. Regarding identities and narratives, longstanding inhabitants of *Oberbarmen & Wichlinghausen* see their local identity as being with their specific district rather than with the *Oberbarmen & Wichlinghausen* combination, as is reported in three expert interviews. The area also has two separate citizens' associations. *Wichlinghausen* is perceived as being more traditional with more active citizens, whereas *Oberbarmen* is seen as being more multicultural. The whole area has a rather negative image within the city and its inhabitants perceive their districts as being neglected by the city administration.

The mood in the district *Arrenberg* is described in the interviews by, "it can't get much worse, so it can only get better" a few years ago. Today, there is a strong upward dynamic, expressed by the practice partners in the quip "Good news feeds good news, as bad news fed bad news in the last 40 years." *Arrenberg* is said to have both the shabby and the chic and due to rapid change, a district identity may develop in the next few years. There are new investments in building and new shops and cafés, which is recognised by the district's inhabitants and results in some people being proud to live there. In the orbit of *Aufbruch am Arrenberg*, there is a spirit of optimism and a self-perception of being a forerunner and of quickly implementing new ideas. This is reported as being highly motivating, leading to further participation in the undertaking of making *Arrenberg* climate-neutral. Furthermore—as with *Oberbarmen & Wichlinghausen*—being the object of scientific research is perceived as enhancing the district's image.

Regarding the *Mirke district, Utopiastadt*, the RWL practice partner's charitable organisation, together with other civil society organisations, has become a point of focus and identity with a narrative of its own: people are just beginning to speak of *Mirke* as a district in the making. Until recently it had been a nameless administrative part of *Wuppertaler Nordstadt* (Wuppertal North Town). As in *Arrenberg*, the driving force in district development is seen to be civil society organisations rather than the constrained municipal administration.

Regarding the *institutional context* that the research is carried out in, Wuppertal offers a wide range of research institutions. These include the *University of Wuppertal*, the *Wuppertal Institute for Climate, Environment and Energy*, their joint *Center for Transformation Research and Sustainability (TransZent)*, as well as other higher education institutions and research-related institutions. For example, the participation method *Planungszelle* was developed in Wuppertal by Peter C. Dienel, founder of the university's *Institute for Democracy and Participation Research—Research Centre for Public Participation* [92,93]. The research project on transforming well-being in Wuppertal is based at *TransZent* primarily. It is the first research project of this young institute. Given its founding institutions—the University of Wuppertal and the Wuppertal Institute—*TransZent* has access both to applied environmental and sustainability research and to disciplinary and fundamental research and their respective scientific communities. The institute also is well-connected to local and regional civil society actors, as well as to parts of public administration.

4.2.2. Staff, Resources and Processes

As conditions and constraints of staff and resources strongly interact, they are summarised in one single section. As already indicated, the research presented in this article is part of the research project "Well-being transformation Wuppertal" (WTW), funded by the German Federal Ministry of Education and Research for a three-year period (2015–2018). The academic staff is employed in this project at *TransZent* and several workshops were funded by the project as well. Both *TransZent* and *Wuppertal Institute* are for the most part funded by third-party-funded research in the area of sustainable development. However, practice partners need to rely on their own resources.

Since mid-2015, Wuppertal has had a new mayor and is the first German city with a Public Participation Unit [94], with which the researchers are cooperating in different subprojects, such as the use of well-being dimensions for participatory budgeting (Appendix B). In contrast to the

transdisciplinary processes with RWL practice partners, which were part of the research plan from the very beginning, the cooperation with the city emerged in the course of the project. All in all, the new mayor and the municipal administration are open to transformation and to alternative urban development ideas like well-being transformation.

We also cooperate with a group of ‘hacktivists’ in and around *Utopiastadt* to make available our research on Wuppertal’s civil society organisations. *Utopiastadt* is both a location in the *Mirke* district and a non-profit civic and cultural association. The “creative cluster” hosts many projects and activities, like workshops, concerts, co-working and hacking spaces, food sharing, urban gardening and an open data initiative [95]. Our common interest in conceptualising and setting up a suitable interactive online platform led to the emergence of a co-led transdisciplinary process. Here, communication issues came up, as hackers, practitioners and scientists often had different languages, working methods and expectations of the process and the goals. This has been complicating and prolonging the process but also resulting in mutual learning. The practitioners’ work for this project was not funded and their contribution was voluntary and on top of daily work. However, funding has been already successfully applied for in the meantime (Appendix D).

RWL Oberbarmen & Wichlinghausen

Regarding the scientific arm of the *Haushüten* project in *Oberbarmen & Wichlinghausen* (see Paragraph 5 in Section 3.2), the RWL is staffed by one part-time *junior* scientist. But the RWL was initiated and drafted by the supervising *senior* scientist in cooperation with the *senior* practice partner, who was the director of the Wuppertal Local District Development Association (WQG) at that time. WQG is a small company owned by several municipal public bodies and is the RWL practice partner organisation. The sub-project is now operated by a regular employee of the WQG with very limited resources (5 h/week). The well-networked former director increasingly retreated in order to run (successfully) for the mayor’s office. Due to the imbalance of resources between science and practice and personnel discontinuities, the delimitation of roles turned out to be difficult, endangering the junior scientist to become the project’s manager, which she also perceives as having been the senior practice partner’s expectation in the first place. Furthermore, connecting practical project work and the facilitator role with writing a disciplinary PhD thesis is perceived as challenging. Nevertheless, both the junior practice partner and the junior scientist have a social science background and speak a common language, so they understand each other despite the science-practice gap.

While the junior scientist has some expertise in sustainable urban development, the operating TD team lacked the knowledge of tenancy and tax law that was essential for implementation of the *Haushüten*-project. However, this was ultimately compensated from external sources brought in by another RWL-researcher’s practice partner, *inter alia*. Despite these problems, all stakeholders show high motivation and openness towards mutual learning, research and the specific project ideas. Especially the former senior practice partner not only hopes for scientific input but also for practical support in reducing empty apartment state, resource input and marketing, for example through the simple fact that the district is being researched. Both practice partners complain that their share of work is not funded but they admit that they were rather naïve in this respect. As the situation curtails their capacity for commitment, this also impacts their overall satisfaction with the *Haushüten* project. In the meantime, resource scarcity has receded a little bit, as a student research assistant has been hired and an additional partner organisation has come on board.

The *Haushüten* project started from scratch. In order to specify it and to include further stakeholders, two public co-design workshops were held, resulting in a steering group and cooperation with other relevant practitioners. The steering group serves a number of functions: it is a protected discourse arena, shares responsibility, anchors *Haushüten* in local networks and is tasked to sustain the *Haushüten* project beyond the overall three-year time-frame. It thereby mitigates the challenges of the RWL. For an overview of the RWLs’ characteristics, see Table 2.

Table 2. City and Selected District RWL Characteristics in Comparison ([83,86,88]; and own interviews).

Characteristics	Wuppertal	Oberbar. & Wichlingh.	Arrenberg	Mirke
Staff, Resources & Process				
Type of practice partner	<i>municipal & 'hacktivists'</i>	<i>semi-public quart. dev.</i>	<i>green-business</i>	<i>green-alternative</i>
Process & roles over time	<i>emerging</i>	<i>inconsistent</i>	<i>inconsistent</i>	<i>consistent</i>
District Characteristics				
Population numbers	355,000	33,000	5400	8100
Migration background	↑ 35%	46%	52%	53%
Unemployment rate	↓ 9.6%	14.6%	9%	13.3%
Identities & narratives		<i>negative image, left behind</i>	<i>on the upswing, "We are the makers"</i>	<i>district in the making, multi-cultural</i>

RWL Arrenberg

The *Arrenberg* RWL is researched by a part-time junior scientist with a social science and spatial planning background and with expertise in sustainable urban food strategies. Like the junior academic in *Oberbarmen & Wichlinghausen*, she was not familiar either with the district or with her practice partners before her job began. However, in both cases, the practice partners were involved in their recruitment, embodying the principle of co-leadership.

Aufbruch am Arrenberg has 80–100 members, the subgroup *Essbarer Arrenberg* around 30. Both are dynamic groups of volunteers, including business people, advertisers and artists, who communicate primarily via social media and have wide networks. Its leaders host the meetings and are practice partners: The leader of *Aufbruch am Arrenberg* is the initial practice partner, whereas the leader of *Essbarer Arrenberg* joined at a later stage. The leader of *Aufbruch am Arrenberg* sees all relevant actors in the district as being somehow connected to his group and his and the group's attitude of 'doing instead of discussing' is perceived as being widely appreciated, giving participants the chance to start projects without anyone hampering them. *Essbarer Arrenberg* is seen as one of the most successful sub-projects of *Aufbruch am Arrenberg*, with significant impact on civic engagement in the district due to its low-threshold theme, easy participation and communication.

Like in *Oberbarmen & Wichlinghausen*, the initial practice partner first expected the junior scientist to act as part-time district manager for a carbon free *Arrenberg* district, whereas she struggled with her role and with balancing the disparate demands of science and practice. In contrast to *Oberbarmen & Wichlinghausen*, the sub-project was already in place when she arrived, so her primarily reflective role—somewhat disengaged from everyday practice as outlined in the RWL concept [34]—was easier to achieve. The junior scientist participates in the regular meetings of the *Essbarer Arrenberg* group, gives advice if requested and supports reflection on and formulation of goals and strategies for sustainable development. Her strategic inputs and personal and institutional networks are valued by all stakeholders. The initial practice partner is still critical in retrospect about the initial co-design phase and the lack of funding of his share of the RWL in particular. However, all involved parties are motivated and open-minded for mutual learning and the development of concepts for well-being transformation. The main amount of operational science-practice cooperation has been shifted from the initial practice partner to the leader of *Essbarer Arrenberg*, which is also due to the thematic focus on local sustainable nutrition. The practice partners share the broader underlying normative framework of well-being transformation, even if the researchers' particular focus on sufficiency practices is not the main concern of *Aufbruch am Arrenberg*.

RWL Mirke

In comparison with *Arrenberg*, the *Mirke* RWL takes a different approach to sustainable district development and well-being transformation. Here, slow, reflective progress is promoted in order

to take along as many citizens and actors as possible. Its strong practice partner organisation *Utopiastadt* (Utopia City) is characterised by its creative, culture-related, green-alternative milieu. *Utopiastadt* also established the *Forum:Mirke*, a platform for *Mirke* district development in which relevant actors participate. The *Forum* had considerable influence on the latest municipal integrated action programme for the district [88] and is the part-time junior scientist's main focus [34]. With a background in environmental psychology, he researches citizen participation in bottom-up sustainable district development and analyses its conditions and effects. The delimitation of roles is discussed openly and in mutual understanding with the two practice partners of *Forum:Mirke* and *Utopiastadt* and is regarded as unproblematic. At the same time, as in the other RWLs, the practice partners are dissatisfied with the fact that their contributions to the WTW project are not funded. Both practice partners and scientist are highly motivated and open to mutual learning, though.

In contrast to both *Oberbarmen & Wichlinghausen* and *Arrenberg*, the junior scientist and practitioners knew each other before the project started. The junior scientist was already in charge of the sub-project's aspect in the original research proposal, which he had discussed with his practice partners from the onset. Although the research proposal application process was perceived as asymmetrical, the junior scientist and practitioners developed a good working partnership. They discuss research questions and preliminary results together and the junior scientist feels highly valued for his reflection, analysis and further input both on abstract-theoretical levels and on specific local issues. As the views of all participating actors on sustainability and well-being-transformation are very close, the normativity of the transformative project is not an issue.

Having three RWLs in one project has its merits. The common focus of parts of the interdisciplinary research team on RWLs creates a *protected discourse arena* about the challenges and conditions of transdisciplinary research, offering back-up in difficult questions and processes. Transdisciplinary process competencies were gained at project start with the support of professional workshops, offered by Prof. U. Vilsmaier and Prof. R. Scholz and relevant literature.

Moreover, at the request of participating stakeholder groups, an informal exchange platform was established to provide regular dialogue sessions in a familiar circle. This monthly *Stammtisch* (regulars' table in a pub or café) takes place in the evening. Several small groups in each RWL also have evening meetings so that volunteers can participate after work.

4.2.3. Normativity

The challenge of *normativity* of transformative research shows through in the process of *participatory indicator development*. On the one hand, we prescribe the goal of well-being transformation by aiming to develop indicators measuring multidimensional well-being including sustainability aspects. On the other hand, we aim for true participation and transdisciplinarity. We cannot fully resolve this tension but we try to mitigate it by initiating open discussions on good life; participatively assessing how relevant the well-being dimensions having been put forward by us are for citizens, civil society organisations and city officials; and welcoming proposals for the modification of the alternative well-being dimensions.

In *Oberbarmen & Wichlinghausen*, the normativity of the sustainable well-being approach sometimes causes implicit conflict with more traditional mind-sets of upward revaluation, which are to a certain extent represented by practical actors in the steering group. These individuals are less interested in big questions of well-being transformation but in hands-on project work of finding suitable rental properties and tenants. This is supposedly due to their perception of the district being below standard, which makes gentrification and the underlying logic of growth appear attractive to them. Nevertheless, working relationships are characterised by openness and commitment. The researcher's strategy here is to facilitate well-being transformation through communication and working on the practical issue of *Haushüten*, activating citizens and pointing out alternatives to conventional gentrification, such as addressing also fugitives and artists as potential tenants.

5. Discussion

Employing different approaches in transforming well-being in Wuppertal, we also reflect different conditions and constraints regarding these approaches (see Section 2 and Paragraph 6 of Section 3.2).

In literature on *transdisciplinary processes*, the agreement, reflection and adaption of roles are seen as crucial, as well as co-leadership, a common language, regular and open dialogue, openness, a protected discourse arena, transparent distribution of financial resources and institutional support. Particularly in the co-design phase, most of the mentioned conditions (except common language) were not being met sufficiently in *Oberbarmen & Wichlinghausen* and *Arrenberg* RWLs but the project has got on track later on.

When lacking *staff and resources*, trade-offs regarding staff expertise and the realisation of ‘ideal’ roles in the course of the project may occur. In our case, this also influenced the satisfaction of the participating actors. Recruiters then must choose among different necessary specialisations. Including practice partners in the recruitment process and the negotiation of recruitment criteria is a reasonable part of *co-leadership* in such contexts. However, this condition cannot fully compensate for the structural constraint. This is especially evident in the *Oberbarmen & Wichlinghausen* RWL, where staff lacked specialised knowledge of tenancy and tax law, which then was obtained through external resources.

In addition, there may also arise a trade-off between narrowly sticking to one’s defined role and the functioning of the sub-project. In *Oberbarmen & Wichlinghausen*, for instance, the practice partner simply did not have enough resources to bring forward the practical part of the sub-project on his own, so the junior scientist had to step in to sustain the sub-project at all. This pushes the researcher in process facilitating and action-oriented roles. Under these circumstances, it proofed to be even more important to facilitate the formation of a *steering group* in order to share the burden of practical work.

Role conflicts have occurred almost only in sub-projects with *high science-practice interaction* and *no participation of the operating junior researchers during the first co-design phase*. The latter affected the consistency of role expectations over time and satisfaction with one’s own and others’ roles negatively. When the operating scientist and practice partner already worked successfully together in the first co-design phase (phase of application for funding), the subsequent co-design and co-production were effectively pre-tested, usually reducing conflict potential and facilitating common discussion of the research question and roles from the very beginning.

Consistent with literature, we found that *openness* towards suggestions from all partners is important and can lead to significant improvements, as was the case in Wuppertal regarding the establishment of the informal exchange platform (*Stammtisch*) and the group that develops the online mapping tool, both proposed by practitioners. Regular and open *dialogue* and *discourse arenas* may also be, at least partially, institutionalised in workshops and steering groups as is the case especially in the *Oberbarmen & Wichlinghausen* RWL. Finding suitable organisational forms proofed to be a condition for smooth transdisciplinary and transformative processes. Ideational support by the project’s research institutions was provided from the very beginning.

In *transformative research*, the dominant scientific institutions are questioned. However, dominant scientific institutions in turn question the explicit normative demands of transformative research, which they partly regard as critical and too excessive for science.

As an example of a dominant scientific institution, the *regular research funding structure* in many cases favours science jobs and neglects practice jobs, which often relegates the practitioners’ workload to leisure time and voluntary commitment, for example in two of our RWLs and the developing of the interactive mapping platform (at least at the beginning). Furthermore, a three-year funding period does not provide enough time for observing sustainable long-term transformational impact. This is why WBGU calls for 50 urban RWLs for 50 years ([32] p. 454).

Of course, apart from the time frame, these constraints might be special features of the Wuppertal case. In transdisciplinary case studies by ETH Zurich and ISOE, the main practice partners are not volunteers but larger stakeholders that usually launched the respective studies and benefitted directly from the solutions found [17,96–100]. Furthermore, in ETH td-studies on sustainable

urban transformations, a multiple of the number of scientists and practitioners are involved [98,99]. These settings allow for solid funding, specialisation in roles and expertise and the use of extensive methods and procedures, all of which are constrained in the different, publicly funded case of Wuppertal.

Schneidewind et al. ([20] p. 8) ascribe science the tasks of *initialisation* and *catalysis* of societal transformation processes, inter alia. In resource-constrained environments, we learned that catalysing is easier and more consistent than initiating: One benefits especially from employing already existing processes, structures and ideas, like *Forum:Mirke* or *Essbarer Arrenberg*, in contrast to the *Haushüten* project, which started from scratch. This *jumping on the bandwagon* also eases the delimitation of roles and still provides sufficient opportunities for interventions, given that the actors, structures and processes are flexible and open-minded. This is because pure initialisation is unsustainable when there is no practice partner with sufficient resources to take over the transformation process. In this case, the researcher is prone to fill the gap and may become a mostly action-oriented change agent, neglecting her scientific tasks.

For transformative science is committed to catalyse sustainable development, the *normativity* of its research framework is inevitable. If this is combined with a transdisciplinary approach or participatory methods, it might create challenges and trade-offs between substantial aspirations (sustainability transformation) on the one hand and true, substantial inclusion of practitioners and the wider public on the other. This is reflected in heterogeneous conceptions of well-being in participatory indicator development and transdisciplinary cooperation in the *Haushüten* RWL. Different from pure transdisciplinary research, transformative researchers are often biased in the selection of stakeholders and the inclusion of their interests, as the (normative) research goal usually is provided and not negotiated. In this regard, they lean to a certain degree towards action research, e.g., transition management, without necessarily buying into its constructivist premises ([25] pp. 14–15). This is true at least for our WTW project. The closer the practitioners' (and scientists') attitudes overlap with the project objectives, the easier the research cooperation seems to be. Having said that, making possible paths of sustainable well-being known to other actors is in itself transformative. And, of course, differing views facilitate mutual learning. So, this normativity is both a condition of well-being transformation and a constraint for co-design and smooth project implementation. Thus, transformative research must be challenging in order to be transformative.

In approaches of *local sustainability transition*, cities are generally highlighted as being crucial for sustainability transition. Also, cooperation with local non-science actors, most particularly change agents, is stressed, as well as the consideration of the respective city's *Eigenart*. In urban transition labs, the motivation of volunteers, uncertainty and scarce resources are identified as challenges.

These challenges are likewise found in our RWLs. *Shortage of resources* might be a common lament in research projects but it is especially critical in transformative and transdisciplinary research, given the multiple demands of the projects at the levels of practice, scientific PhD research and science-practice interaction. All levels are quite resource-consuming regarding money (staff, workshops, events, public relations), time and both hard and soft skills. Most of the practice partners have consequently already indicated that their participation in future research collaborations will depend on the availability of external funding so they can afford the additional time, despite their high level of motivation.

A certain affinity of *change agents* for scientific research as well as transformation towards sustainability is very helpful. To meet the challenge of inducing and sustaining the *motivation* of *volunteer citizens*, the *Essbarer Arrenberg* group is particularly successful in their approach. It combines low thresholds to participation, tangible and early results, modern communications, themes related both to abstract sustainable development and to concrete everyday life, a narrative of success and innovation and a popular leading actor to motivate, inspire and provide the necessary infrastructure. *Forum:Mirke* focuses on integration, creativity, strategic thinking and impact on the city administration and is sometimes slowed down by taking along as many people as possible. The simple fact of participating or living in a group or district that is being researched by the University and the Wuppertal

Institute, sometimes provided pride and motivation. The development of the Wuppertal well-being indicator system requires less participation, which is largely self-motivating.

City districts prove to be good spatial boundaries of RWLs so far, for they are a source of identity and, regarding their size, suitable targets for tangible well-being transformation. Nevertheless, their socioeconomic structures and historical paths may not only facilitate but also constrain this kind of transformation. The Wuppertal districts examined here are quite heterogeneous in their assemblage of inhabitants, with high rates of unemployment and large groups of citizens with migratory backgrounds. This is a challenge for integration and failing herein may endanger the project of well-being transformation by becoming solely an elite or niche transformation project. Many Wuppertal districts have undergone deep structural changes, which on the one hand may necessitate new visions of district identity and development, as well as well-being. This may result in a pressure to act, which may in turn lead to new narratives of progress and success that will strengthen local identity and motivate inhabitants to participate, as in the *Arrenberg* project. On the other hand, it may also leave longstanding inhabitants feeling left behind, without the motivation or energy for transformation towards sustainable well-being.

RWLs draw on the approaches and the respective conditions and challenges discussed above. For *action-oriented approaches*, different researchers' roles and possible trade-offs between direct relevance for practical outcomes and scientific rigour are mentioned. As expected, we have seen the different expectations on *researcher's roles* as particularly challenging. In interaction with RWL settings, this leads to different role foci, like change agent and process facilitator on the one hand (especially in *Oberbarmen & Wichlinghausen*) and knowledge broker and (self-)reflexive scientist on the other (especially in *Mirke* and *Arrenberg*). However, there are strong variations over time and significant intersections across the RWLs. We also experience the trade-off between *catalysing practical outcomes* and *aspiring scientific rigour*, as both is very time consuming and requires different skills. If resources are scarce, this trade-off is difficult to mitigate. This finding also relates to the mentioned criticism of transformative science regarding its 'excessive demand'. In the Wuppertal case, we partially alleviated this situation by including additional actors with own resources, as has happened in the *Oberbarmen & Wichlinghausen* RWL.

6. Conclusions

For *well-being transformation*, contextuality and participation are stressed and both the level and the understanding of well-being should be addressed (see Section 2.5). As this article focuses on framework conditions which are by definition causally distant to the outcome, we have not made any assertions regarding guaranteed success criteria with measureable effects on well-being transformation in Wuppertal. However, reflecting on conditions and constraints based on experiences of others found in literature, we were able to report on strengths and weaknesses, mitigating tactics and certain mechanisms that are at work and which plausibly influence Wuppertal's well-being transformation.

Wuppertal is an ambiguous field for local well-being transformation: supportive in its rich landscape of civic engagement and its cooperative city officials and strategies, but driven by the city's constrained leeway for urban development. The city's huge social and economic heterogeneity creates chances for niches but constrains a city-wide transformation that will take along all inhabitants.

The research project on transforming well-being in Wuppertal enjoys institutional support and excels through a highly-motivated team of academics and practitioners eager to learn from each other. To facilitate exchange, we established new organisational forms. The project also addresses key drivers and structures of sustainable urban transformation, e.g., governance, collaboration and learning and precincts [41]. It also takes up the WBGU [32] demands. By indicator development, mapping activities and RWLs, both contextuality and participation are addressed, as well as the level and the understanding of Wuppertal's well-being (see Section 3.2 and Appendixs A–E). At the same time, we struggle with adverse timeframes that hamper co-design as well as the promotion and evaluation of long-term real-world impacts. However, as this research project on transforming

well-being in Wuppertal is only TransZent's first one, this project is supposed to be the 'stirrup holder' for parallel and future similar projects. Hence, learnings and activities started by the project are to be perpetuated, taken up and recalibrated to further catalyse Wuppertal's well-being transformation in the middle and long run.

All in all, parts of our analysis reflect the findings, requirements and recommendations found in the literature on transdisciplinarity, transformative research, sustainable urban transitions, RWLs, action research and well-being transformation. The case study results nonetheless set their own accents and feed back into academic and practical discourses. For example, having few operative staff and low resources makes supervision and mutual support even more important—as does 'band-waggoning' when selecting the transformative projects in the first place. This also calls for the increased emergence of alternative funding schemes that will meet the needs of both science and practice, enabling trustful relations from the very beginning of co-design. Moreover, the role of city districts as suitable boundary objects has been emphasised ([41] p. 6) and facilitating factors like narratives of departure and commitment and the timely production of tangible results—at least on the practical side—were identified. The positive effect of 'being researched' on single participant's attitudes adds a small but interesting further insight to the discourse on transdisciplinary and transformative research approaches. And the discovery of challenges regarding the project's normativity should cause serious reflection in transformative science.

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Author Contributions: All authors co-developed the design of the study (see Paragraph 6 of Section 3.2). Katrin Maibaum and Michael Rose designed, conducted and analysed the expert interviews. Katharina Schleicher developed the well-being indicators and prepared and analysed the telephone interviews. Katrin Maibaum provided content for Section 2.1, which was then co-written by Katharina Schleicher and Michael Rose. Michael Rose wrote the abstract; Section 1; last paragraph of Section 2.2; Sections 2.3 and 2.4; Section 3 (except first part of Section 3.1 which was co-written by Katharina Schleicher); Section 4.2 (except first paragraph of Section 4.2.1); Sections 5 and 6; and the Appendixes C and E. Katharina Schleicher wrote Section 2.2 (except the last paragraph); Section 2.5; partly Section 3 (esp. first part of Section 3.1); Section 4.1; first paragraph of Section 4.2.1; provided content for Section 4.2.3 and wrote Appendix A; Appendix B (co-written by Michael Rose); and Appendix D. All authors checked the main paper. Michael Rose edited the full paper.

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Appendix A. Conceptualisation and Measurement of New Well-Being Dimensions and Indicators

In the process of developing a well-being definition for Wuppertal and specific indicators, numerous indicator systems were reviewed. We found that sustainability indicator systems and well-being indicator systems largely overlap. Regarding sustainability indicator systems, indicator sets comparing cities in the world or certain regions, standards for indicator systems as well as reviews of specific indicator sets for selected cities, mainly developed in the context of the local agenda 21 processes, were reviewed [60,63–65,67,70,101–106]. The review of well-being indicator systems included indicators for nation states, cities and regions [61,62,72,107–110]. The aim is to develop well-being indicators for Wuppertal, including also sustainability aspects but going beyond that. For several reasons, such as its high prominence, OECD's Better Life Index (BLI) is used as baseline. Dimensions of other well-being concepts are also taken into account and the respondents of our survey were given the possibility to add further topics, which they perceive as important.

Appendix A.1. Survey of Well-Being Perceptions

Based on the BLI, the well-being dimensions and corresponding indicators were adapted to the context of the city of Wuppertal, including well-being perceptions of residents and decision-makers. As indicated above, the well-being definition and well-being indicators were developed in a multi-step participation process. This involved a workshop with members of civil society organisations, a survey, as well as an expert interview with a former employee of the municipality who developed sustainability indicators for Wuppertal in the beginning of the 2000s, which were only calculated and published in one single report in 2004 [111].

The workshop, oriented towards the method of transdisciplinary workshops, described by Defila and Di Giulio [112], took place in January 2016. The goal of the workshop was to discuss perceptions of well-being and the good life especially in Wuppertal with members of civil society organisations, who aim to improve the well-being of residents of Wuppertal with their voluntary activities. 22 members of organisations and initiatives took part in the workshop and discussed their definitions of and requirements for well-being. The different ideas were clustered by the moderators and later rated by the participants.

The results of the workshop—further knowledge about the importance of certain issues for the well-being in Wuppertal—were included in the development of a questionnaire.

In this questionnaire, the respondents were asked to rate the following items from 1 (not important) to 10 (very important):

- Income
- Education
- Work place
- Housing condition
- Personal security/protection against crime
- Health
- Civic engagement
- Community
- Environmental quality
- Local public transport
- Pedestrians
- Bicycle routes
- Parking slots and streets
- Green areas, forests
- Accessible culture and leisure programme
- Integration of immigrants
- Shopping facilities and local supply in the neighbourhood
- No disadvantages of certain living areas
- Public squares and spaces
- Personal life satisfaction
- Other (*with the possibility to name and rate another issue*).

In addition, they were asked to rank 11 dimensions of well-being according to their importance:

- Income, job
- Housing condition
- Education
- Security/protection against crime
- Health
- Civic engagement

- Community
- Environmental quality
- Infrastructure
- Culture and leisure opportunities
- Personal life satisfaction.

Moreover, the respondents had the opportunity to write in their own words, what well-being means for them and what has to be done to ensure well-being of future generations in Wuppertal. The last 15 questions asked for the socio-economic characteristics of the respondents.

1000 persons with principal residence in Wuppertal were randomly selected from municipal data and contacted via mail (random sample). They were asked to answer the questionnaire either online with a personal code or by ordering a paper-and-pencil questionnaire. 124 persons answered the questionnaire online, additional 48 on paper. The effective return rate was 17.6%.

In addition to the random sample of residents of Wuppertal, parts of the questionnaire were also given to members of the organisation *Essbarer Arrenberg*. As some questions were modified and not all included in this questionnaire, the results of the group *Essbarer Arrenberg* are only partly comparable with the random sample of residents of Wuppertal. However, the results of both, the main survey as well as the group *Essbarer Arrenberg*, are still in the process of analysis and only very limited first results can be published at the current stage.

Table A1. Sample and response rate of survey “Good life in Wuppertal” (Own source).

Random Sample	1000
Not-Deliverable	23
Adjusted Sample	977
Online Returns	124
Paper-and-Pencil Returns	48
Total Returns	172
Effective Return Rate	17.6%

These first results show differences in the preferred conceptions of well-being between three non-mutually exclusive groups. Compared to *Wuppertal’s population* who considers health and individual life satisfaction as crucial for well-being, the *representatives of committed civil society* particularly value possibilities of involvement (civic engagement), infrastructure and environmental quality. The group of *Essbarer Arrenberg* ranks individual life satisfaction, environmental quality, education and community rather high among the well-being dimensions, whereas security is seen as less important compared to *Wuppertal’s population*.

Appendix A.2. Indicator Development

Results of the questionnaire and the workshop are being used to develop well-being indicators especially for the city of Wuppertal. To each well-being dimension, indicators are allocated, both measuring the specific circumstances in Wuppertal, such as the quality of the water of the river Wupper, as well as the respective indicators of the BLI, allowing comparison with other cities and regions. Currently, the first version of indicators and dimensions are being presented to and discussed with representatives of the municipal administration as well as with civil society organisations to ensure their usability for these actor groups. In the following step, the dimensions and indicators of well-being shall be published showing changes of the level of well-being in the different dimensions over time in Wuppertal.

Appendix B. Facilitation of the Use of the Indicator System by Politicians and Citizens

To establish the well-being indicator system as a management tool for urban development and to spread information about the research project and especially the development of well-being definition and indicators, the researchers took part in different meetings, such as the steering group meeting of the city strategy Wuppertal 2025. In addition, they got in touch with different municipal employees, especially of the departments public participation, urban development and statistics. Out of these contacts with municipal employees as well as active citizens, the researchers were invited to a meeting of a citizen advisory group, planning a participatory budgeting (Bürgerhaushalt Wuppertal) led by the staff unit public participation. The researchers presented the well-being dimensions for Wuppertal and decided, together with the municipal and civic members of the planning group, to use the dimensions as a decision-making tool for the participatory budgeting process, which is currently under realisation [89].

Table A2. Draft Hand-Out for Citizen Workshop in the Process of the Participatory Budgeting. Description of Well-Being Dimensions; original document in German (Own source).

Dimension	Description	Question
Income	Income including all additional benefits available to the Wuppertal population.	Does the project create the opportunity for people in Wuppertal to increase their income, e.g., by promoting the economy?
Job	The availability of good and secure jobs and measures of the 2nd labour market.	Does the project create new or better jobs, e.g., as part of 2nd labour market measures?
Living Environment	Sufficiently large apartments in good condition at affordable prices in a good residential environment.	Does your project improve the living situation in Wuppertal, e. g. by upgrading vacant buildings?
Infrastructure	Municipal infrastructure such as public transport, roads, pedestrian and cycle paths as well as local supply (local shopping facilities).	Does your project improve the urban infrastructure or supply of people in a short distance to the place of residence?
Security	Refers to crime rates, accident probability and prevention work as well as to places that give rise to fear and sense of security in Wuppertal.	Does your project increase safety in Wuppertal, e.g., by defusing fears or preventing accidents?
Education	Refers to both school education (school-leaving certificates) and further education, workshops and training opportunities.	Does your project create new opportunities for inhabitants of Wuppertal to educate themselves?
Leisure and Culture	Good offers and barrier-free access to leisure activities such as art and culture and the time to use them (offers, distance to the place of residence, costs).	Does your project create new offers that can be used in leisure time?
Environmental Quality	A clean environment in the city with fresh air, clean water and parks. Air and water quality in Wuppertal as well as noise pollution, green areas, environmental protection projects and land use.	Does your project improve the environmental quality in Wuppertal, e.g., air, water or green spaces?
Health	A long, healthy life and the prerequisites for it, such as good medical care. Life expectancy, state of health as well as health-promoting offers and surroundings (nutrition, exercise, educational work).	Does your project contribute to a better health and a longer life for the people of Wuppertal?
Civic Engagement	The possibilities of the people in Wuppertal to shape their city, e.g., in voluntary work, in elections or through citizen participation.	Is it possible for people in Wuppertal to improve their city through their project, e.g., in their own projects or through participation in city projects?
Community	Personal social relationships, support for/by friends and relatives, as well as public spaces, networking and social commitment such as neighbourly help.	Does your project bring the people in Wuppertal closer together?
Life Satisfaction	General personal satisfaction with life and the neighbourhood, the district and the city. This also includes identification with the district and the city.	Does your project make more people in Wuppertal happy or satisfied?

Through these different contacts and processes, the new well-being definition and first drafts of the indicator sets were already successfully disseminated in the city. In addition, the indicators and dimensions are used for an outcome estimation of the contributions of civil society projects to the local well-being.

Appendix C. Mobile Phone App “Happy Wuppertal”

The well-being dimensions are also included in the survey of the ‘Happy Wuppertal’ app mentioned above to gain subjective data on the well-being dimensions and to connect individual data with geodata. The app was launched just recently and has hundreds of self-selected users (numbers are rising) who participate in the ongoing survey. Users are able to give individual feedback on places and things they are (not) happy with in Wuppertal, e.g., by uploading photos. This data is expected to be made available to the city administration in an anonymous form to help targeted city development. All data will be analysed biannually [90,91].

Appendix D. Mapping of Wuppertal’s Civil Society Organisations

To map Wuppertal’s civil society initiatives and their stated contributions to the well-being dimensions, we conducted 44 short structured telephone interviews with members of civil society organisations, employing the snowball method. The interviews lasted between 30 and 60 min and were carried out with representatives of the organisations. One question asked for the main network partners. This information was included in the data pool and map and, in addition, used for the further selection of interview partners following the snowball method.

The data provides information about the characteristics of the organisations, such as the year of foundation, the number of active and passive members, the activities and activity radius, network partners, a categorisation of the projects in the dimensions of well-being as well as challenges they are facing in their work in Wuppertal. Some of the challenges reported are presented in Section 4.2 of our article.

In order to provide some of this information for further research, networking and cooperation, we joined forces with other local mapping initiatives and a group of ‘hacktivists’ to develop a suitable public online platform. The meetings showed the high interest in a map of initiatives, projects and networks in the city. Out of the mapping project and the different meetings, a further transdisciplinary project developed. In the process of co-design the researchers, civil society organisations and programmers discussed the requirements for a map, which could be used by citizens, researchers and civil society. In addition, project acquisition for further projects was conducted successfully in order to continue the development and programming of a platform in a bigger scope. The co-design is currently in progress and first results expected in mid-2018. More information may be retrieved from www.transformationsstadt.de.

Appendix E. Real-World Laboratories in Three Districts of Wuppertal

The research project team researches and supports specific well-being transformations in three RWLs. The RWL approach is presented in detail by Wanner et al. [34]. In all three RWLs rough systems analysis have been conducted by gathering core statistical data of the district and qualitative information on its image. This is deepened by constellation analysis for the RWLs’ specific real-world problems, gathering and connecting data on actors, technical elements, natural elements, signs and hybrids, as well as their relations to each other [113,114]. The knowledge on the RWL-specific constellations is co-produced in workshops with practice partners and local experts on the issue.

Within the RWLs, the researchers do practice-related project work like moderations, presentations and consultancy, as well as participatory research and social science research, using methods like participatory observation, interviewing and research diaries. Through a common reference system, i.e., well-being transformation, a common transformative and transdisciplinary research approach and the use of common methods (including common analysis criteria, e.g., in research diaries) in

each of the three RWLs, we also hope to identify factors and conditions of well-being transformation that extend relevance beyond the individual RWLs. However, due to the high process orientation which also comes along with a dependency on stakeholders which are often volunteers, the planning and enforcement of a strict research plan is to some extent both inadequate, as it would hamper the flexibility needed and hard to achieve.

We also teamed up with our practice partners and colleagues in order to research how and which well-being dimensions are addressed in each of the RWLs. The well-being dimensions given, in workshops we identified impact factors for each dimension and specified influence direction (negative, positive) and strength (neutral, weak, strong) in a semi-quantitative manner. The contributions were standardised to enable comparisons within and across the RWLs [115]. However, these effects are per se very limited and we do not expect them to change the numbers in the set of well-being indicators at the city level.

In the following, we would like to present selected results of our workshops with RWL researchers and their practice partners on the RWLs' contributions to the well-being dimensions [115]. The group *Essbarer Arrenberg* is especially aiming to contribute to the dimensions civic engagement, community, education and environment. They do this inter alia by having recruited 30 new volunteers, participating at district conferences, networking, organising 'restaurant days', 'food-sharing', a publicly placed 'farmbox' and workshops for pupils. The group is also interested in changing the understanding of well-being of the district's residents. *Forum:Mirke* aims to improve the dimensions civic participation and community, inter alia by testing innovative ways of local civic participation and by having shaped the districts official integrated action plan. *Haushüten* mainly addresses the dimensions housing environment and community, inter alia by bringing people together and by aiming at reducing vacancies. Here, some stakeholders hold rather traditional thought patterns of upward revaluation. Nevertheless, the working foci of the RWLs on the whole show rather high overlaps with the goals of our transformative research project, aiming at transformation in the direction of sustainable well-being.

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