RA XIMHAI
Vol. 18 Núm. 3 ESPECIAL
enero-junio 2022
85-123

REVITALIZATION OF BROWNFIELDS IN SHRINKING CITIES EXEMPLIFIED BY THE URBAN FARM IN DESSAU. A GREEN INNOVATION AREA AS A PART OF THE BMBF PROJECT GIAGEM

REVITALIZACIÓN DE CAMPOS BALDÍOS EN CIUDADES EN REDUCCIÓN EJEMPLIFICADA POR LA GRANJA URBANA EN DESSAU. UN ÁREA DE INNOVACIÓN VERDE COMO PARTE DEL PROYECTO BMBF GIAGEM

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Abstract

This bachelor thesis is about the revitalization of urban brownfields in shrinking cities. The project "Urban Farm Dessau" is used throughout the thesis as an example.

Different social processes, such as structural change and demographic change, lead to changed conditions in cities. One consequence of this is that shrinking processes are continuing and this leads to the creation of brownfields, which are often not used again. This process of urban sprawl often results in the decline of districts or entire cities.

In the project GIAGEM "The Role of Green Innovation Areas in Revitalizing German and Mexican Cities" of the Technical University of Kaiserslautern and the University of Guadalajara, alternative solutions for the revitalization of such brownfields are being developed, which at the same time meet bio-economic requirements. Various sustainable and efficient uses are analysed and evaluated on the basis of example projects and their transferability to other cities is specified.

First of all, the scientific framework conditions are elaborated in this thesis. For this purpose, the key words "Brownfields", "Revitalization" and "Urban Farming" will be defined and classified.

The project GIAGEM will be presented in more detail in order to establish the connection to the chosen example project "Urban Farm Dessau".

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Recibido: 05 de noviembre de 2021. Aceptado: 25 febrero de 2022.
Publicado como ARTÍCULO CIENTÍFICO en Ra Ximhai 18(3): 85-123.
doi.org/10.35197/rx.18.03.2022.04.al

The project "Urban Farm Dessau", which was developed in the city of Dessau-Roßlau, in the district Am Leipziger Tor in Sachsen-Anhalt, will be analysed in more detail by means of a preliminary study and with the help of an area reference. The project is finally evaluated by means of a criteria grid. The results of the evaluation form the basis for recommendations for action, which represent a possibility of transferability of this project to other cities and locations.

Finally, a conclusion about the project is given, summarizing the knowledge gained from the analysed chapters and evaluating whether the Urban Farm is a suitable form of sustainable brownfield revitalization and an innovative approach for sustainable urban development.

Resumen

La revitalización de terrenos baldíos urbanos en ciudades en proceso de contracción. El proyecto "Urban Farm Dessau" se utiliza a lo largo de la tesis como ejemplo.

Diferentes procesos sociales, como el cambio estructural y el cambio demográfico, conducen a cambios en las condiciones de las ciudades. Una consecuencia de esto es que los procesos de reducción continúan y esto conduce a la creación de terrenos abandonados, que a menudo no se vuelven a utilizar. Este proceso de expansión urbana a menudo resulta en el declive de distritos o ciudades enteras.

En el proyecto GIAGEM "The Role of Green Innovation Areas in Revitalizing German and Mexican Cities" de la Universidad Técnica de Kaiserslautern y la Universidad de Guadalajara, se están desarrollando soluciones alternativas para la revitalización de dichos brownfields, que al mismo tiempo cumplen con bio- requisitos económicos. Se analizan y evalúan diversos usos sostenibles y eficientes a partir de proyectos de ejemplo y se especifica su transferibilidad a otras ciudades.

En primer lugar, en esta tesis se elaboran las condiciones marco científicas. Para ello, se definirán y clasificarán las palabras clave “Brownfields”, “Revitalización” y “Urban Farming”.

El proyecto "Urban Farm Dessau", que se desarrolló en la ciudad de Dessau-Roßlau, en el distrito Am Leipziger Tor en Sachsen-Anhalt, se analizará con más detalle mediante un estudio preliminar y con la ayuda de una referencia de área. . Finalmente, el proyecto se evalúa mediante una tabla de criterios. Los resultados de la evaluación constituyen la base para las recomendaciones de acción, que representan una posibilidad de transferibilidad de este proyecto a otras ciudades y localidades.

Finalmente, se brinda una conclusión sobre el proyecto, resumiendo el conocimiento obtenido de los capítulos analizados y evaluando si Urban Farm es una forma adecuada de revitalización sostenible de brownfield y un enfoque innovador para el desarrollo urbano sostenible.

“Urban Farm" project in Dessau

The project "Urban Farm Dessau" is examined and analyzed in the following within the framework of the research project "GIAGEM". First, the city of Dessau is classified according to its initial situation, the economic situation as well as the infrastructure. Subsequently, the project area is examined in more detail and the overall project is presented in general. With the help of a criteria grid created in advance, the project is evaluated and finally assessed.

Classification of the city & region

Dessau is a district of the independent city of Dessau-Roßlau and is located in the state of Saxony-Anhalt in the east of Germany (Figure 1). Until July 2007, Dessau was a district-free city.

Figure 1. Location city of Dessau-Roßlau.

Source: Modified from Google Earth Pro, 2019.

The city is located about 180 kilometers north of the Czech border and about 130 kilometers west of the Polish border. The next largest cities in terms of population are Halle (Saale) and Magdeburg and, together with Dessau-Roßlau, form the three major centers of the state of Saxony-Anhalt. Halle is located about 40 kilometers south of Dessau-Roßlau and about 52 kilometers southeast is the city of Leipzig. Just like the German capital Berlin, which is about 130 kilometers away, all cities can be reached via the A 9.

Dessau-Roßlau covers an area of 245 km^2 and has 80,693 inhabitants. Accordingly, the population density of the city corresponds to about 329.4 inhabitants per square kilometer. Saxony-Anhalt has an area of 20,452 km^2 and

2,200,288 inhabitants. Accordingly, the population density of the state is about 107,6 inhabitants per square kilometer, which is about one third of the density of the city of Dessau Roßlau (Statistisches Landesamt Sachsen-Anhalt, 2019a).

Initial situation

The initial situation of the city of Dessau-Roßlau is analyzed in more detail in the following chapter based on the population, demographic and socioeconomic change, climate, as well as land culture and education.

Population

Dessau-Roßlau currently (June 30, 2019) has 80,693 inhabitants, including 39,183 men and 41,519 women. The proportion of foreigners is 4,574 or 5.67% (Statistisches Landesamt Sachsen-Anhalt, 2016a).

The independent city of Dessau-Roßlau is divided into 25 municipal districts. With 10,365 inhabitants, the Roßlau urban district has the highest population and, together with the district "Innerstädtischer Bereich Nord" (10,295 inhabitants), forms slightly more than a quarter of the total city population. The "Urban Farm Dessau" project is located in the Innerstädtischer Bereich Süd district, which has a population of 6,149, making it the fifth largest district in Dessau-Roßlau (Stadt Dessau-Roßlau, 2017a).

As of June 30, 2019, the state of Saxony-Anhalt had a population of 2,200,288, meaning that only about 3.7% of the state's population lives in Dessau-Roßlau, making it the smallest city in Saxony-Anhalt (Statistisches Landesamt Sachsen-Anhalt, 2019d).

Demographic and socioeconomic change

A 2015 study by the Bertelsmann Stiftung indicates that Germany's population will shrink by about half a million by 2030 (Bertelsmann Stiftung, 2015a). The population decline is distributed very differently among the individual federal states. While the populations of Saxony-Anhalt, Thuringia, Mecklenburg-Western Pomerania and Saarland will fall, in some cases by more than 10%, other states will grow. States such as Bavaria, Baden-Württemberg, Hesse and Schleswig-Holstein, as well as the city states, Hamburg and Bremen, will gain

population, in some cases by double-digit percentages (Bertelsmann Stiftung, 2015b).

Accordingly, demographic change is progressing strongly in Saxony-Anhalt and Dessau-Roßlau. A negative population trend is forecast. Compared to Germany, Saxony-Anhalt will experience a very high population loss of 13.6% by 2030. Dessau-Roßlau, on the other hand, has the highest population loss by 2030 in a direct comparison with Germany and Saxony-Anhalt, at 16.2% (Bertelsmann Stiftung, 2015a; Bertelsmann Stiftung & Wegweiser Kommune, 2015).

The projected age structure in Saxony-Anhalt also shows that, despite the declining overall population, the number of people of retirement age in Saxony-Anhalt (67 and older) will continue to rise in the future. Currently, Saxony-Anhalt has the oldest population in Germany with an average age of 47.9 years (2018). While in 2014 there were still 35.9 pensioners (67 years and older) for every 100 people of working age and 23.8 young people (under 20), in 2030 the old-age dependency ratio will be 54.6 and the young dependency ratio 28.7 (Statistisches Landesamt Sachsen-Anhalt, 2016b). At 36.9%, the proportion of people aged 65 and over will then make up the largest part of the population of Dessau-Roßlau (Bertelsmann Stiftung & Wegweiser Kommune, 2015).

Climate

According to the climates of Siegmund and Frankenberg, Dessau-Roßlau is in the zone of a semi humid, maritime climate of the mid-latitudes with an annual average temperature between 0°C and 12°C. There are six to nine humid months in the year and the annual fluctuations of the monthly average temperatures range between 10°C and 20°C (Westermann Kartographie, n.d.–b).

The climate classification according to Troll and Paffens is based on the temperatures, the water balance as well as the vegetation. Dessau-Roßlau is located in a cool temperate zone, in which the sub-oceanic climates of the forest climates prevail. That is, the winter is mild to moderately cold and the summer is moderately warm to warm. The precipitation maximum is in summer and autumn. The vegetation period is over 200 days. The main vegetation is sub-oceanic deciduous and mixed forests (Westermann Kartographie, n.d.–a).

The mean temperature of the coldest month is 0.0°C in January, while the mean temperature of the warmest month is 18.3°C in July. Thus, the annual average temperature is 9.2°C. The maximum value of precipitation in the mean monthly sum is 61 mm in June. The lowest value is 29 mm in February. The annual sum of precipitation in Dessau-Roßlau corresponds to 501 mm (Climate Data, n.d.).

Education

General school education in Germany includes the Hauptschulabschluss (lower secondary school), the polytechnische Oberschule (polytechnic secondary school), Realschulabschluss (secondary school) and the Fachhochschulreife or Hochschulreife (higher education entrance qualification). In Dessau-Roßlau, the polytechnic high school diploma is not listed because the statistics assign the diplomas to the Hauptschule or Realschule leaving certificate.

Figure 2 shows the direct comparison of general school education by qualifications of Germany, Saxony-Anhalt, and the city of Dessau-Roßlau. Nationwide, the proportion of the population with lower secondary school qualifications was 30.4% in 2017. Saxony-Anhalt is at 16.7% and Dessau-Roßlau at only 8.9%. It is clear that in Dessau-Roßlau the proportion of Realschulabschluss (37.6%) and also Fachhochschulreife (46.3%) are significantly higher than those of the state and the federal state.

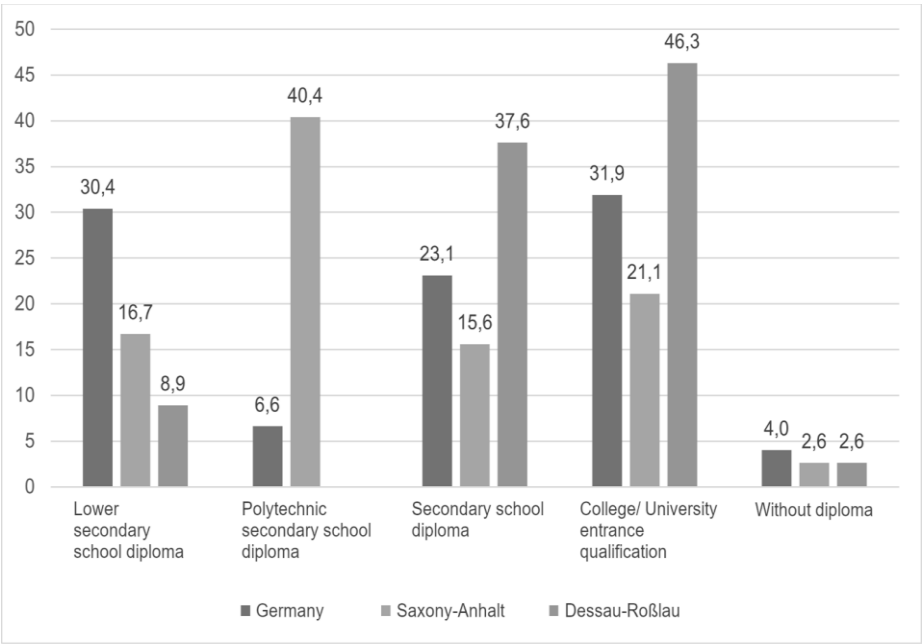

Figure 2. General school education of the population in comparison [%, 2017].

Draft: Own representation, Kaiserslautern, 2019.

Source: Bertelsmann Stiftung & Wegweiser Kommune, 2017, p. 7; Destatis - Statistisches Bundesamt, 2020b.

Figure 3 shows a comparison of the vocational education attainment of the population of Germany and Saxony-Anhalt in 2017 and Dessau-Roßlau in 2011. In Saxony-Anhalt, just under 60% completed an apprenticeship or vocational training in the dual system, compared with around 10% less in Germany. In Dessau-Roßlau, just over half of the population had vocational training in 2011. Accordingly, the majority of the population in Germany, the state of Saxony-Anhalt and the independent city completed an apprenticeship or vocational training in the dual system. Around 7-8% of the population in Germany and Saxony-Anhalt graduated from a technical college, and almost twice as many in Dessau-Roßlau in 2011. The proportion of university graduates in the German population is 16.4% and is higher than in both the state of Saxony-Anhalt and the city of Dessau-Roßlau. Only 7.3% graduated from university in the independent city. Germany overall has a share of 25.6% of the population without a vocational qualification, i.e., about a quarter of the German population did not have a vocational qualification in 2017. Saxony-Anhalt and the city of Dessau-Roßlau are significantly lower, with 15.5% and 15.6% respectively.

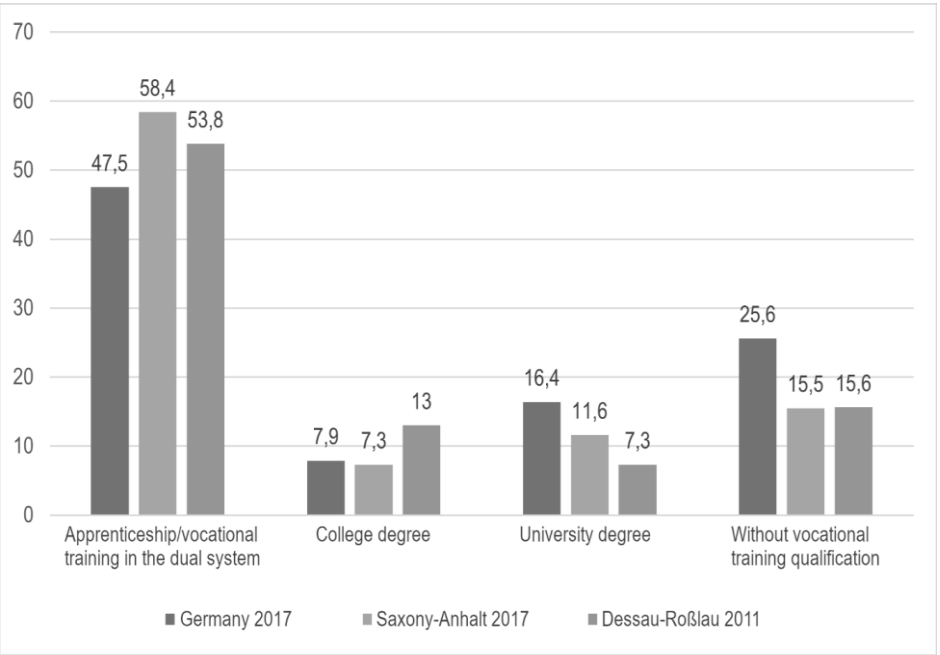

Figure 3. Comparison of occupational qualifications of the population [%].

Draft: Own representation, Kaiserslautern 2019.

Source: Destatis - Statistisches Bundesamt, 2020c; Zensusdatenbank, 2011.

Economy

In this section, the economic situation of Dessau-Roßlau is classified. To this end, various aspects, such as employees subject to social insurance contributions (sozialversicherungspflichtig Beschäftigte), unemployment, the average income of residents, the gross domestic product and the available subsidies are examined in more detail.

Employees subject to social security contributions

A distinction must be made between the various sectors of the economy in terms of employees subject to social insurance contributions at the place of work. A distinction is made between agriculture and forestry, manufacturing/processing, trade, hospitality, transport, and other services.

Table 1 first shows the number of employees subject to social insurance contributions.

Table 1. Number of employees subject to social insurance contributions in Germany, Saxony-Anhalt and Dessau-Roßlau

	2015	2016	2017	2018
Germany	31.333.146	32.007.270 ↑	32.731.752 ↑	32.422.016 ↓
Saxony-Anhalt	776.293	783.900 ↑	792.591 ↑	799.074 ↑
Dessau-Roßlau	33.516	33.524 ↑	33.717 ↑	34.101 ↑

Draft: Own representation, Kaiserslautern 2019.

Source: Destatis - Statistisches Bundesamt, 2020a; Statistisches Landesamt Sachsen-Anhalt, n.d.–b.

In the independent city of Dessau Roßlau, 34,101 employees subject to social insurance contributions were registered in 2018. “Miscellaneous services” represented the strongest economic sector with 18,600 employees. This is followed by the manufacturing industry as well as trade, transport and hospitality. Like in the rest of Germany, agriculture, forestry and fishing, are the smallest

economic sector in Dessau Roßlau, with only 262 employees (Statistisches Landesamt Sachsen-Anhalt, n.d.–b).

Looking more closely at the industry structure of Dessau-Roßlau, it can be seen that the highest employment is primarily in the manufacturing industries, i.e., mechanical engineering, repair and maintenance of machinery or motor vehicles, as well as health and social services (Industrie- und Handelskammer Halle-Dessau [IHK], 2018).

Unemployment rate

A total of 3,212 unemployed persons were identified for the city of Dessau-Roßlau on average for 2018. Of these, 1,830 were men and 1,382 women without employment (Statistisches Landesamt Sachsen-Anhalt, 2019b, p. 15). In addition, 436 foreign unemployed persons, 54 unemployed persons under 20 years of age, and 1,198 unemployed persons 50 years of age and older were recorded in 2018 (Statistisches Landesamt Sachsen-Anhalt, 2019b).

The unemployment rate has declined in Germany as well as in Saxony-Anhalt and Dessau-Roßlau in the years from 2016 to 2018. In 2016, 6.1% of all civilian labor force members were still unemployed, in 2018 only 5.2%. In Saxony-Anhalt, the unemployment rate was at 9.6% in 2016, 3.5% higher than in Germany. In 2018, Saxony-Anhalt then recorded a decrease of 1.9%. In Dessau-Roßlau, this rate was 9.3% in 2015, slightly below the average for Saxony-Anhalt. In 2018, a decrease of 1.7% was recorded. This means that the unemployment rate in Dessau-Roßlau is also slightly below that of the state of Saxony-Anhalt (Bundesagentur für Arbeit, n.d.; Destatis - Statistisches Bundesamt, 2019; Statistisches Landesamt Sachsen-Anhalt, 2019b, p. 13).

Household income

The purchasing power of the population depends, among other things, on the disposable income of private households. It corresponds to the income that accrues to private households and that is used for consumption and savings purposes. Per capita disposable income in a given year is calculated by adding transfers received from the state (e.g., monetary social benefits) to the primary income of private households on the one hand and deducting income and wealth taxes, social contributions and other current transfers that have to be paid by private households on the other. Public benefits in kind, which accrue to private households, are not considered here. In 2018, the per capita disposable income of private households in Germany was €23,295. In Saxony-Anhalt, it was only

€18,648. In the independent city of Dessau-Roßlau, it was €19,294. It is clear that the city's residents have a comparatively very low purchasing power, but have the highest purchasing power in the entire state of Saxony-Anhalt (Seils & Bauman, 2019).

Gross national income

Gross national income defines the sum of earned income of all inhabitants of a state or a country. In 2018, the gross national income in Germany amounted to €3,437.908 billion. Moreover, since 2009, the GNI has been increasing at a constant annual rate; in that year, it amounted to €2,500.874 billion (Destatis - Statistisches Bundesamt, 2020f).

In Saxony-Anhalt, the GNI was €64,957 million. This means that the state only has a share of 1.9% of Germany's total GNI. The GNI has risen steadily in Saxony-Anhalt since 2009 (Statistisches Amt Mecklenburg-Vorpommern, 2019).

It is not possible to determine GNI for the city of Dessau-Roßlau, but it is possible to determine total disposable income, as well as disposable income per inhabitant. Total disposable income amounted to €1,642 million in 2017. In 2016, disposable income increased by 3.2% (€798) per inhabitant in Dessau-Roßlau compared to 2015. Disposable income in Dessau-Roßlau already grew above-average in this period. In Saxony-Anhalt, the increase was 2.7%. Disposable income per inhabitant was €19,953 in 2017 and has also risen steadily since 2009 (Statistisches Landesamt Sachsen-Anhalt, 2019c).

Gross Domestic Product

Gross domestic product, or GDP for short, is the measure of an economy's economic performance over a given period, usually over the course of a year. It measures the value of all goods and services produced or generated domestically. GDP is the most important figure in national accounts, as it enables comparability in terms of the prosperity of the country or area in question (Destatis - Statistisches Bundesamt, 2020e).

Since these values are difficult to compare, the following figure shows the GDP per inhabitant. Figure 4 thus compares the gross domestic product per inhabitant of Germany, Saxony-Anhalt and Dessau-Roßlau.

GDP per inhabitant in Germany was €38,059 million in 2016, while in Saxony-Anhalt it was only €26,674 million in the same year. GDP per capita in Dessau-Roßlau is also significantly lower than in Germany, at €29,907 million in

2016. Saxony-Anhalt as a federal state has the lowest GDP per capita and is around one-tenth below that of the federal state.

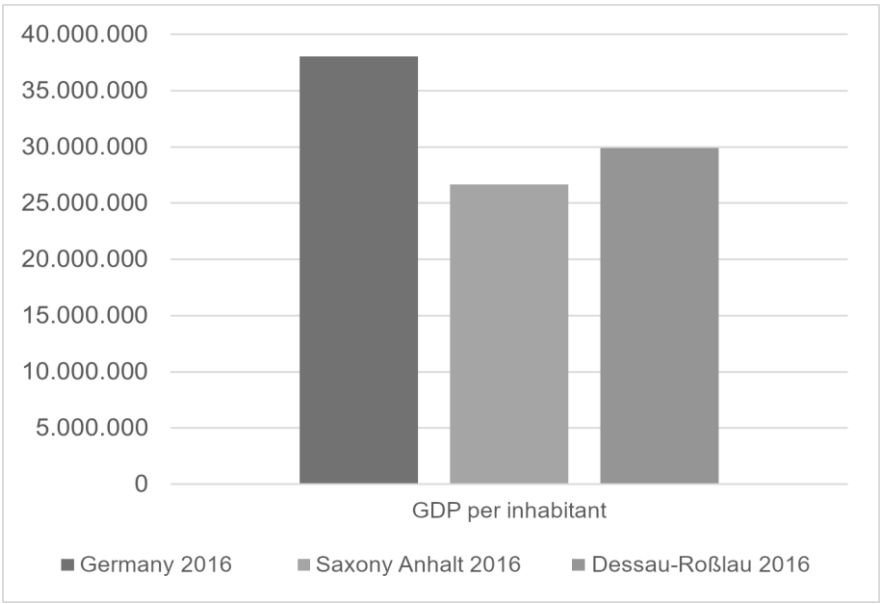

Figure 4. GDP per inhabitant in million euros in Germany, Saxony-Anhalt and Dessau-Roßlau.

Draft: Own representation, Kaiserslautern 2019.

Source: Der Bundeswahlleiter, 2020; Deutschland in Zahlen, n.d.; Statista, 2020.

Subsidies

The urban renewal and redevelopment in Dessau-Roßlau makes use of several funding programs of the European Union (EU), the federal government and the state. Urban development funding includes the programs of Active Urban and District Centers, Smaller Towns and Municipalities, Socially Integrative City, Urban Heritage Protection and Urban Redevelopment East and West. Dessau-Roßlau is currently registered in the Urban Redevelopment, Urban Restructuring, Socially Integrative City and Active Urban and Local District Centers programs. Within the framework of these programs, a number of redevelopment areas or support areas have been defined that require funding. Figure 5 provides an overview of the various funding programs in Dessau-Roßlau.

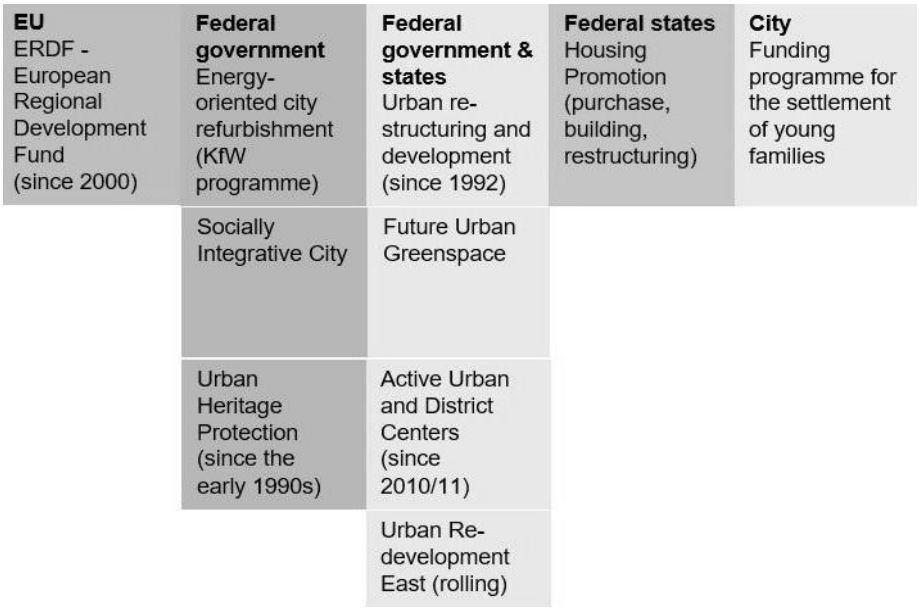

Figure 5. Various funding programs in Dessau-Roßlau.

Draft: Own representation, Kaiserslautern 2020.

Source: Bauförderer, n.d.; Grün in die Stadt, n.d.; Landesportal Sachsen-Anhalt, 2020; Stadt Dessau-Roßlau, 2017b, 2017c, 2017d, 2017e.

Infrastructure

In the area of infrastructure, the city of Dessau-Roßlau is analyzed in terms of supraregional and regional connections. A distinction is made between road, rail, air and shipping traffic.

The city is connected to the supra-regional highway network by the federal highways B 184 and B 185, which intersect in the city area, as well as the B 187, which intersects the B 184 in the northern city area. The A 9, which crosses the city area, can be reached in the east as well as in the south. The A 14 can be reached in the west. Dessau-Roßlau is therefore well connected to the regional and supraregional road network.

With regard to the rail network, the stations "Dessau Hauptbahnhof", "Roßlau Bahnhof", "Dessau Süd", "Bahnhof-1841", "Rodleben", "Dessau Mosigkau", "Roßlau (Elbe)", "Dessau-Alten" and "Bahnhof Wörlitz" can be found in Dessau-Roßlau. These stations allow direct regional connections by S-Bahn and regional

trains as well as express trains, supraregional connections from the terminus "Dessau Hauptbahnhof" with the IC are also possible.

The public transport system in Dessau-Roßlau is well developed with streetcar and bus lines and nightliners (night bus lines). There are many bus and streetcar stops, also outside the city center, which are served regularly as well as on Sundays and holidays and at night (Dessauer Verkehrsgesellschaft [DVG], 2019).

The Mulde River runs through the city area in the east. Shipping traffic is also present in Dessau-Roßlau on the Elbe. With its central location and direct connection to the federal highways B 184 and B 187, the federal motorway A 9 and the core network of the DB AG, the industrial port of Roßlau offers optimal location conditions in trimodal traffic (Sächsische Binnenhäfen Oberelbe GmbH [SBO], 2020). In addition, the city has a yacht club on the middle section of the Elbe (Yacht Club Dessau e.V., n.d.).

The Leipzig/Halle airport is located about 50 km south of the city (DVG & Stadtwerke Dessau [DVV], n.d.).

Classification of the project area, area reference

After the city of Dessau-Roßlau has been examined and analyzed in more detail, the next step is to classify the project area of the "Urban Farm Dessau" and establish area spatial reference. First, however, the preliminary investigation of the project will be explained in more detail. Subsequently, the location and size of the area will be examined in more detail, and the traffic connections (roads, rails, ports) will also be determined in the spatial context. The project area is also examined regarding its surroundings and environment as well as the existing situation and also examined for existing contaminated sites and soil contamination.

Preliminary investigation

Due to population decline and housing vacancies in Dessau-Roßlau, buildings were systematically demolished on a large scale. As a result, a landscape has emerged that divides the city into smaller urban islands (city islands). This large number of brownfields in the city makes it necessary to find sensible interim and subsequent uses. Currently, many brownfields are not re-used and are perceived negatively by the population. As part of the International Building Exhibition (IBA) Urban Redevelopment 2010, initial attempts were made to make this new urban landscape productive under the motto 'Urban Cores - Landscape Zones'. It was discussed to use the areas for renaturation or flood protection, but also to

create wilderness or waterlogged areas to improve the urban climate. In addition, active forms of cultivating the areas were addressed. Neighborhood and urban gardens played a leading role. They should function as cultivation areas for renewable raw materials or healthy food directly in the neighborhood. Through these so-called claims, experimental areas were allocated to interested parties, who tested the ideas for temporary use over a period of 5 to 10 years.

In the Dessau neighborhood "Am Leipziger Tor", the project of a neighborhood farm was developed for this purpose. The idea behind this project is to practically test strategies of local and self-sufficiency with healthy food and renewable energies. The idea is to create an urban farm that will also serve as a new kind of learning site, linking economic value creation with educational and social work. The "Urban Farm Dessau" was initiated by Heike Brückner, a landscape architect and employee of the Bauhaus Foundation, and Uwe Zimmermann, a qualified garden planner and gardener. In March 2013, the project was accepted into the Robert Bosch Foundation's "Neulandgewinner" program for just under two years (Stiftung Bauhaus Dessau, 2014).

An expert workshop on the topic of "Image and Economy of the Urban Farm" was held at the Bauhaus in mid-March 2014 to promote professional exchange. Around 30 local and external experts from the fields of architecture, art/design, energy and urban gardening were invited and worked together on the spatial and content planning. Central questions were developed, which were to be dealt with and answered as far as possible in the course of the preliminary investigation (Stiftung Bauhaus Dessau, n.d.).

As a result of the issuance of the first symbolic "share certificates" in the Urban Farm on the occasion of an art action of the Federal Environment Agency (UBA) in Dessau, the project was not only considered in terms of its profitability, but also with a focus on new forms of participation in a solidary economy. Comparable - successful - examples like the Prinzessinnengärten in Berlin, "o'pflanzt is!" or the Kartoffelkombinat in Munich, the Hofgut Oberfeld near Darmstadt or the Selbsterntegärten in and around Kassel are located in large cities and/or in the old federal states. An attempt was made to adapt these examples in growing large cities to a dramatically shrinking city in eastern Germany (Stiftung Bauhaus Dessau, 2014).

In addition to the work on organizational models, business plans and the development of forms of participation, the first practical steps for a concrete implementation were taken. As one of the first measures, a meadow orchard was planted with partners from the neighborhood in order to establish contacts in the neighborhood with whom the urban farm can be further developed as a community project. Furthermore, an experiment was started to graze urban redevelopment areas with goats. Goats were borrowed from a friendly Dessau

association and, by acting as emission- and cost-free lawnmowers, have become important popular figures and have thus generated positive associations for the project (Landesenergieagentur Sachsen-Anhalt, 2016). At the same time, concrete ideas about potentially available areas, objects and buildings as well as further partners and fellow campaigners could be gained. This was achieved by means of an analysis of the site, the buildings and open spaces, an analysis of the natural space and potential, and an analysis of the socio-spatial potential (Stiftung Bauhaus Dessau, 2014).

Accordingly, the construction of the neighborhood courtyard is to take place in three stages (see Figure 6):

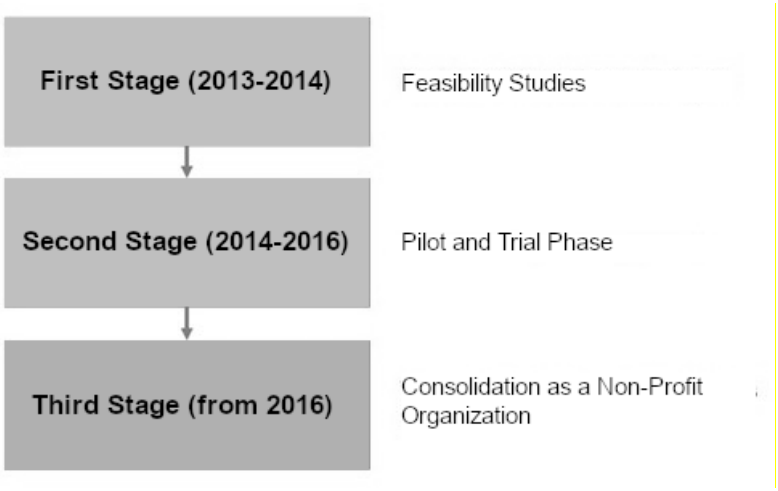

Figure 6. Stages of project development.

Draft: Own representation, Kaiserslautern 2020.

Source: Stiftung Bauhaus Dessau, 2014, p. 8.

In the first stage (2013-2014), feasibility studies were carried out in various areas. This included network formation, the development of trial fields, practical experiments on site, and the development of initial project modules. A development concept and business plan were also drafted. The exploration of sponsoring models, i.e., foundations, cooperatives, stock corporations, associations or non-profit limited liability companies (GmbH) was also undertaken. A permanent financing structure was also determined (foundation, cooperative, joint stock company, consumer society, association or mixture of different).

The second stage (2014-2016) was the pilot and test phase. Here, an exemplary realization of a local material and energy cycle was developed, as well as the implementation and further development of project modules in the field of urban gardening and renewable energies. At the same time, the project entered the market with educational offers, renewable raw materials, and healthy food.

In the third stage (from 2016), the aim was to stabilize the Urban Farm as a non-profit enterprise. The goal is to achieve sufficient revenue generation for basic financing of personnel and operating costs.

Economics

The aim is to establish the Quartiershof as a long-term, self-supporting enterprise that operates according to the principle of community enterprises. The economic core of the "Quartiershof" enterprise is the production of healthy food and the generation of renewable energy (including biogas). In addition to cultivating land in the surrounding landscape, the creative and crafts department produces a district newspaper, carries out small artistic projects and creative security measures on vacant buildings. A "climate-friendly" café is also part of this, which is "run" by young people within educational measures.

This strategy is intended to result in black figures at the end of the profit and loss account. Profits from the sale of products and services flow back into educational activities, social work, and the design of the Quartiershof.

The three economic pillars are:

- Urban gardening
- Energy & Recycling
- Education (Stiftung Bauhaus Dessau, 2014).

Location/ Size

In order to be able to classify the location or size of the project area, both the geographical and topographical location and the urban and overall spatial classification as well as key data and plan statements and the current status are considered.

Geographical position

The project area, with approximately 50,000 square meters, is located in the district of Dessau, in the city district "Innerstädtischer Bereich Süd" (see Figure 7). This borders the "Innerstädtischer Bereich Mitte" district to the north, the "Mildensee" district to the east, the "Süd" district to the south and the "West" district to the west. The project is implemented as a neighborhood courtyard in the urban district "Am Leipziger Tor".

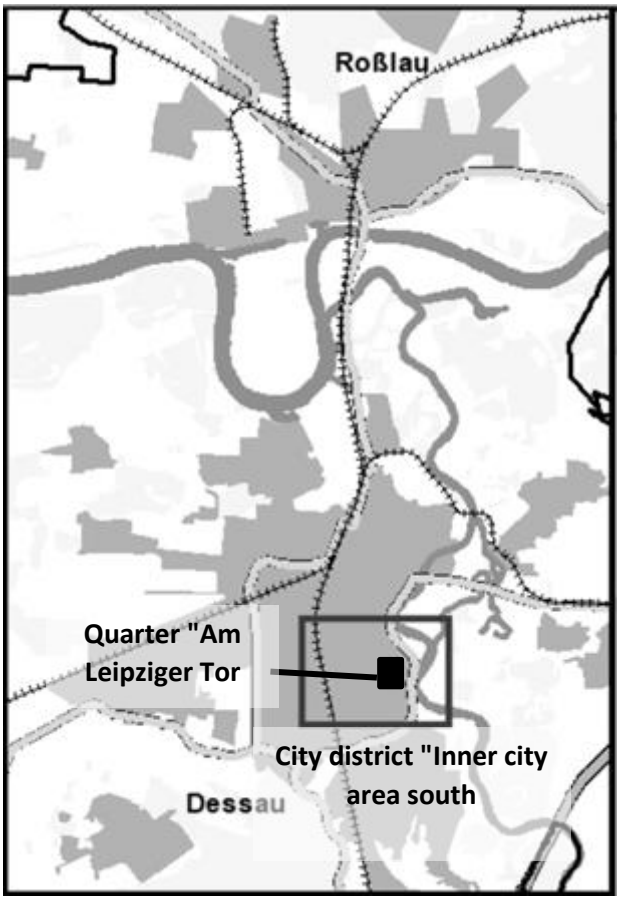

Figure 7. Location of the project area.

Source: Modified according to Stadt Dessau-Roßlau, n.d.

The district "Inner city area south" is, with a size of 60 hectares, one of the smallest districts of the urban district Dessau. About 25% of the total area is used for agriculture. Residential, industrial, commercial and traffic areas seal about 40% of the district. About 20% of the total area is used for recreational areas, which are partially sealed, while 10% of the urban district is not sealed (Stadt Dessau-Roßlau, 2018).

Topographic position

The project area lies at an altitude of approximatively 63-65 meters above sea level. The entire city of Dessau-Roßlau has only slight differences in elevation of no more than 20 meters. The eastern part of the city is slightly higher with up to 73 meters above sea level in some parts and the western part is slightly lower with about 59 meters above sea level. The area of the Urban Farm has no relevant elevations or depressions (Topographic Map, n.d.).

Sun and wind conditions

Through the deconstruction, the often-shaded courtyards were dissolved and the open spaces are consequently all well sunlit and oriented to the south. Thus, the south facades of the remaining buildings represent a usable "surface".

The wind conditions are very brisk in the open yards. The question is therefore how these windbreaks can be made usable for the construction of micro wind turbines.

Vegetation and soil

In the former neighborhood yards, there is a rich stock of trees and shrubs, which, however, are of little ecological value for the most part. On the renaturation areas, a rough grassland vegetation can be found. In addition, there is a mature humus-rich soil in the former courtyards, which has a good water storage capacity. On the renaturation areas, there is filled soil, some of which is very lean and contains debris. Here, fertility can be restored by building up the soil, which also contributes to CO_2 sequestration.

(Rain) water availability

There are no natural water bodies or visible depressions in the area. The numerous flat roofs are well suited for collecting rainwater. Saving opportunities through infiltration or collection would also be possible (Stiftung Bauhaus Dessau, 2014).

Urban and overall spatial classification

The project area is located in the southeastern part of the city district "Innerstädtischer Bereich Süd". With 6,149 inhabitants, this is the fifth largest district in the city of Dessau. It has the second highest proportion of foreign residents of all the city's districts. At 9% in 2017, it is significantly higher than the urban average (6%). The proportion of unemployed and low-income people is also well above the citywide level. About one in three households receives social benefits. The average age of the district is 48.1 years, which is "younger" than the city as a whole. With about 25% of residents under 25, the area is particularly young in terms of age structure. There are many young people and many young families, but they face third-generation unemployment and broken employment biographies (Stadt Dessau-Roßlau, 2018).

Fundamentally, the land use in the district is heterogeneous and provides space for different functions. The project site is located in the middle of a residential neighborhood with a high proportion of green space. The area is characterized by multi-story prefabricated housing with large residential courtyards that are in varying conditions. In addition to providing public open spaces, they have a high value for the residential and recreational quality. Row houses and single-family homes are found only sporadically to the south of the project area. To the south and west, the area is also bordered by mixed-use development with a high proportion of green spaces. To the west and southwest of the district are commercial and special development areas, some also with a high proportion of green space. Here runs the S-Bahn and streetcar line 1, which connects the area with the Dessau main station. In between are other green areas such as the "Pollingpark" park and the Israelite cemetery. Adjacent to the project area to the east runs the "Mulde" river. East of the river there are large areas for agriculture and forest. To the east of the area, the landscape of the UNESCO World Heritage Site Garden Kingdom of Dessau-Wörlitz comes close to the residential area. The district is generally characterized by open spaces, which have been continuously created due to the necessary demolition of vacant buildings. Some of them are more intensively maintained or temporarily used, others are semi-natural. Nowadays, these areas have developed, some of them rich in species (Flächennutzungsplan Dessau, 2003).

Key data

The project area is a classic inner-city prefabricated housing area, which has been built as part of the socialist housing construction program since the 1970s. The area was previously also characterized by dominant Wilhelminian style development, fragments of 1930s development and small garden city-like settlements of the 1920s, which are considered an early model of social housing. The area became unattractive as a residential location after reunification due to the unrenovated Wilhelminian and 1930s buildings and the often poor housing condition of the panel system-buildings (Stiftung Bauhaus Dessau, 2014). For this reason, the area was already the focus of urban redevelopment in the late 1990s due to the loss of inhabitants and the associated housing vacancy. Since 2005, vacant buildings have been demolished as part of urban redevelopment in the eastern, northern and southern areas, as well as in isolated cases in the western area. All deconstruction measures were bundled in a coherent area of 90 hectares, which will be extended through the city as a new strip of landscape. A total of around 3,000 vacant and unmarketable apartments were demolished with subsidies. During this, urban cores were "carved out". As a result of destruction, reconstruction, and urban redevelopment as well as a lack of demand for use, the area is dominated by underused or unused areas that are maintained with little effort and whose subsequent use is partly undetermined. In the area, there are potential sites and gaps between buildings in various ownership constellations. In many cases, their extent and subsequent use are not clear. However, this new urban landscape offers above all a rich potential for sustainable urban development: with climate-productive spaces, areas for urban gardening and community gardens in the neighborhood. In these areas, work is being done to cultivate the project area step by step. As part of the IBA Stadtumbau 2010, initial attempts were made to make this new urban landscape productive. Under the motto "Urban cores - landscape zones", a temporally and spatially flexible urban redevelopment strategy was designed, in which urban islands (quarters) are prepared from a future urban landscape. Vacated areas are made available to citizens free of charge, in return for which they take over their maintenance and design. These citizens' claims are an example of new appropriation strategies of peripheral urban space and have become known under the brand "400 sqm Dessau" (Stiftung Bauhaus Dessau, 2014).

Plan statements/status

In several workshops, initial ideas were developed in the sense of a preliminary design, based on the spatial conditions and possible requirements for the neighborhood courtyard, which were guided by various design parameters.

The final design idea includes the buildings or residences as the central element of an urban farm. In the city, the (residential) house is a central point and thus the first unit that can be made horticulturally productive. Accordingly, the buildings with their infrastructure form the basic framework of the farm: Water, workrooms, rooms for storage, roof areas for wind and photovoltaic use, and cellars, which are available for storage. South facing facades and terraces form ideal space for climbing crops such as espalier fruit, wine and all climbing vegetables.

The second unit or zone is the directly adjacent garden and courtyard area. In the immediate vicinity of the living and working area, there is the greatest attention and proximity for the care of horticultural intensive crops (e.g., lettuce, herbs and vegetables).

The third zone is the area with more extensive crops, such as potatoes and beets, which are not as demanding and sensitive in terms of maintenance and water. Everything else, such as meadow orchards or short rotation plantations, can be located at more distant sites, as they only require one or two maintenance passes per year or less.

The result constitutes a multipliable modular principle that includes four cultivation zones:

I. House and building itself
II. narrower yard area with intensive crops
III. the more distant yard area with extensive crops
IV. decentralized sites: in the "Gartenreich", as well as in the city and countryside for short-rotation plantations, for herbs, berries, and fruit crops (Stiftung Bauhaus Dessau, 2014).

In addition, there are various rooms for different uses and functions. For people, there are rooms for education, the operation of a canteen with a kitchen, for exhibitions and community meetings, offices and recreation rooms for gardeners and trainees, and sanitary rooms. There are also rooms for storage and warehousing (biogas silo, fodder, horticultural products, machines, and tools). There are also spaces for the animals that live on the Urban Farm, such as a goat, chicken or rabbit pen, shelters for sheep and watering troughs. Furthermore, there are areas and infrastructure for urban gardening (from composting areas to

growing beds). The facades, roof surfaces, and other areas are used to generate renewable energy with micro wind turbines, solar panels, or water storage tanks.

In addition, protective measures were erected to help against animals, dogs, and theft (during harvest time).

During planning, the energy sources were considered in terms of their use and usability, which is described in Table 2 (Stiftung Bauhaus Dessau, 2014).

Table 2. Different energy sources of the Urban Farm

Wind	**Power generation**	**Micro wind turbines**	**Electricity for own consumption**
Sun	Solar Power	Photovoltaic systems	
	Solar heat/	Solar panels	Water heating, heating, ventilation/cooling
	Solar cooling		Food storage
Biomass	Biogas	Food scraps,	Cooking
		Grass clippings	
		Grasses + Perennials	
		Organic waste	
		Compost/	Water heating
		Biomeiler	
	Heating material	Wood pellets	Water heating + heating
		Wood chips	
		Firewood	
Water Straw + clay	Heat storage	Insulated water storage tank	Use of summer solar energy for heating in winter

Draft: Own representation, Kaiserslautern 2020.

Source: Stiftung Bauhaus Dessau, 2014.

How does the Urban Farm work?

Healthy food is grown in the neighboring green space and processed immediately in the neighborhood canteen. The food leftovers from the neighborhood are then used in the in-house mini-biogas plant. This produces gas that can be used again for cooking. Lawn clippings from the urban redevelopment areas can also be fermented in the biogas plant, which in turn saves transport costs and at the same time makes a useful contribution to the maintenance of these areas.

Thanks to the technical and technological possibilities, people are no longer dependent on central supply hierarchies and there is a gradual switch to decentralized supply and disposal. This method of operation makes neighborhoods self-sufficient in energy or even produces surpluses that they can feed into other grids or "export" to other parts of the city.

The Urban Farm also provides a wide variety of tools, modern machinery, and professionals to ask for advice and, for example, a garden library.

Foremost, the Quartiershof is a (new) place of learning. It is open to everyone, i.e. to residents and guests, to young people and adults, to families, groups or individuals. The contents and structures of the educational work build on experiences gained in the past three years in the project "Mykorrhiza! Learning from the Neighborhood - Working for the Neighborhood". In this project, young people had the opportunity to learn about future-oriented professions in a "temporary district company" and to try them out in practice. The project was a success and met with a positive response, which led to its continuation in the form of a "district company for the long term". By linking youth and social work with education and economic activity, it was possible to create a modern project that meets the current demands of the economy (keyword: shortage of skilled workers) for new types of education and educational content and also makes an important contribution to the structural stabilization of neighborhoods. With the support of local entrepreneurs, young people will be offered qualification modules that are geared to the needs of the neighborhood and to future-oriented industries. For example, renewable energies, creative industries, crafts and urban agriculture. In the neighborhood, the young people experience directly what it means to be professionally active, to contribute their own competencies to a "company" and to develop a local professional perspective. They get to know new occupational fields, are encouraged to enter new professional territory and to do meaningful and value-adding work for the neighborhood. Instructors are "real" entrepreneurs from the neighborhood or from Dessau-Roßlau and partners of educational institutions, which are numerous in the city (Stiftung Bauhaus Dessau, 2014).

Connection

In this section, the local and long-distance connections of the project area and the urban district "Inner-City Area South" are examined. The connections and distances to the superordinate transport network, to bus and train stops as well as bicycle paths and walking distances are considered.

The area is connected to the superordinate traffic network via Gliwicer-/Friedhofstraße in the north, Wasserwerkstraße in the south, Raguhner Straße and Kabelweg in the west and southwest, respectively, and especially via the central Heidestraße. The study area is connected to the B 185, as part of the city's tangent system, in the east via two traffic light intersections. The city center of Dessau with its offerings can be reached on foot in about 10-15 minutes.

The public transport system is represented by streetcar line 1 with three stops directly in the area on Franzstrasse and Heidestrasse. These stops are served every 15 minutes during the week and on Saturdays, and every 30 minutes on Sundays and public holidays. Furthermore, there are bus lines 11 and 12 with the stops "Am Pollingpark", "Bernburger Str.", "Wasserwerkstr." and "Fröbelstr.". During the week, these buses run every 60 or 30 minutes, and on weekends and public holidays they run every 60 minutes. The local transport service is supplemented by bus line 16 with stops at "Stadion/Sportbad" in Helmut-Kohl-Str. (B 185), "Fröbelstrasse" and "Kabelweg". These stops are served every 30 minutes during the week, every 45 minutes on average on Saturdays and every 60 minutes on Sundays and public holidays. The majority of the study area - at least the residential areas - are thus within the 10-minute radius of the streetcar stops (Nahverkehrsplan der Stadt Dessau Roßlau, 2016).

Developed bike paths run along the main thoroughfare, such as Heidestraße and Ludwigshafener/Helmut-Kohl-Straße. The connections Raguhner Straße - Thomas Müntzer-Straße, Klughardtstraße - Augustenstraße, Kabelweg and Am Pollingpark - Pestalozzistraße - Ackerstraße also belong to the main network in everyday bicycle traffic. In addition, two cycling routes of importance for tourism run through the study area.

Important main pedestrian routes are not barrier-free throughout, and the design and development condition are poor. The flowing motor vehicle traffic of Heidestraße and Ludwigshafener/Helmut-Kohl-Straße is well developed and due to the high traffic volume, these are marked as main roads. Due to noise pollution and because of its width with the streetcar tracks, Heidestraße acts as a barrier between the residential areas to the east and west. However, Ludwigshafener/Helmut-Kohl-Strasse more clearly separates the residential areas and the recreational areas or landscaped areas to the east.

Environment

The area is situated in the middle of a residential area. In the immediate vicinity there is also a school for the learning disabled (Pestalozzi school) and two former kindergartens. Most of the buildings are prefabricated slab construction, on the edges of the area there are rows of houses from the Wilhelminian period and the 1930s. Adjacent to the south is a mixed-use area with some social facilities (care center) and the Free Secondary School Dessau-Roßlau. To the north there is also a residential area with a protestant day care center and a protestant city mission. A sports facility, the Paul-Greifzu Stadium, borders to the northeast. To the west, there is also a mixed-use area with Pollingpark and other social facilities such as a senior citizens' residence.

Current situation

The project site there are currently still buildings that were preserved after demolition in the course of urban redevelopment. These buildings are in the prefab style and the most part is still completely unrenovated. Other parts of the site are partially or fully renovated. In some cases, there is still a large vacancy rate in the buildings (Stadt Dessau-Roßlau, n.d.).

Contaminated sites

The project site is not listed in the Saxony-Anhalt register of contaminated sites.

In the area of the project site, the standard land value of residential development land is around 90 euros per square meter. Areas closer to downtown Dessau have values between 105 - 110 euros per square meter. For mixed building areas, it is between 60 and in some cases 85 euros per square meter. The closer the mixed land is to the city center, the higher the standard land value. The standard land value for agricultural land in the surrounding area is 1.40 euros per square meter for arable land. For forestry land in the surrounding area, the value is 0.19 euros per square meter. The value of residential building land is about 70 times and 500 times as high as agricultural and forestry land, respectively (Geoportal Sachsen-Anhalt, n.d.).

Criteria grid

Table 3 provides a summary of the project based on a criteria grid.

Table 3. Criteria grid of the "Urban Farm Dessau" project

Criterion	Questions	Rating
Sector	What? Which sector? Bioeconomic Field: Food, energy, social issues?	The Urban Farm falls under the Bioeconomic Field: - Cultivation of healthy food - Biogas plant, solar power, wind turbines - Learning place and training for young people
Goal/Vision/Idea	How is the goal achievable?	Target: - Local and self-sufficiency in healthy food - Renewable energies with decentralized supply and disposal - Novel place of learning with economic added value - Educational and social work - Development of the neighborhood
Time	When. Timeline? Construction phase? How long is the production phase?	2010: IBA Urban Redevelopment Saxony-Anhalt "400 sqm Dessau" (testing a new urban landscape) 2013: Initiation Urban Farm Dessau by the Bauhaus Dessau Foundation 2013: Inclusion of the project in the Robert Bosch Foundation's "Neulandgewinner" program for just under two years. 2013-2014: Feasibility studies Mid-March 2014: Expert workshop on "Image and Economy of the Urban Farm" at Bauhaus.

		2014-2016: Pilot and testing phase From 2016: Continuation as a non-profit company 2017-2019: Duration of the funding project: Establishment of a learning and meeting place for local and self-supply in the neighborhood Am Leipziger Tor, Dessau From 2019: Further development of the potential for ecological urban development
Actor	Who? What competence?	Project Sponsor: - Bauhaus Dessau Network: - StadtteilAG Economic Stakeholders: - Various entrepreneurs from the city of Dessau-Roßlau in the fields of horticulture, energy, and education - Energietisch Dessau e.V. Social actors: - The Frauenzentrum (Women's Center) - the Volkssolidarität - the day care group “Fallschirm” - the Kleine Arche (Little Ark) - one school - a youth club - a theater initiative - Apartment owners - the Dessauer Wohnungsbaugesellschaft DWG and the Wohnungsverein Dessau

Governance	Development, monitoring and controlling? Corruption?	- Experiences from the IBA Urban Redevelopment 2010: The first attempts to make the new urban landscape productive were made by passing on experimental areas to interested parties through so-called claims, which were initially set up as temporary uses for a period of five or 10 years. Some areas have established themselves to this day as permanent garden projects, educational sites, or recreational areas. - Project is supported by the population and volunteers -> good cooperation with the city as well as the DWG and the entrepreneur network of Dessau-Roßlau
Personal	Personnel required for implementation	The farm was implemented with the help of participants from the fields of architecture, art/design, energy, and urban gardening. Through volunteers, the residents and interested people, the construction and realization took place.

Funding/Money	Subsidies, equity, returns, loans	The areas were provided by the city. The project is funded by the Bauhaus Foundation and the Robert Bosch Foundation "Neulandgewinner" as well as by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety and the National Climate Protection Initiative For the basic financing of the Neighborhood Courtyard, an amount of 80-100,000 euros per year is assumed. The sum is made up of: approx. 60,000 euros for project management approx. 20,000 euros for operating costs approx. 20,000 euros for productive activity.
Area	Where. Site Requirements Market proximity	The project area is located within Dessau's Inner City South district, in the Am Leipziger Tor neighborhood. Around Ackerstraße, the areas are located between the buildings. Central location in the district of Dessau, close to the city center.
Status/Result	Product Output	- Creation of training and employment opportunities - Upgrading of the entire neighborhood (energy self-sufficient) - Feeding the generated surplus energy and food into other networks - Contribution to climate protection (reduction

		of CO_2) and promotion of sustainable urban development - Public access for everyone (advisors, experts, tools, etc.)
Public perception	External effect Effects	- Population or residents were involved in the project from the beginning and followed the planning and supported the construction. - High acceptance and satisfaction of residents -> development of the entire neighborhood - Positive participation of the companies of the city as well as the DWG. - Energy self-sufficient district (solar, wind energy, biogas plant) - Place of learning and educational institution - Urban gardening with healthy foods, animals, etc.

Assessment

The project "Urban Farm Dessau", which is to combine the areas of urban gardening, renewable energies and also education in an urban neighborhood, integrates very well into the existing residential area in the neighborhood "Am Leipziger Tor". Due to the high proportion of greenery in the area, the development of an urban farm represents a sustainable and effective reuse of the many brownfield sites that have arisen as a result of demolition through urban redevelopment in Dessau-Roßlau. Above all, by establishing the use of renewable energies in the form of solar, wind energy and its own biogas plant, the neighborhood is developing energy self-sufficiency. Surplus energy is also fed into other grids, which also benefits the surrounding neighborhoods. Through the cultivation of healthy food as well as animal husbandry, the residents but also the institutions (hotels, schools, restaurants, day care centers) in the surrounding area are directly supplied. This promotes and advances sustainable urban development. Above all, the image of the neighborhood "Am Leipziger Tor" and

a structurally weak shrinking city is improved and experiences positive perception from the outside. For tourists, too, the Urban Farm forms a "green station" in the city. At the same time, the educational offer with workshops, seminars, etc. plays a role here again, as this is accessible to everyone.

The economic strategy is also a positive factor. The profits from the sale of products and services flow back into educational activities, social work and the design of the neighborhood farm, so that the project can support itself independently. The wide-ranging business network that also supports the Urban Farm strengthens and links connections to other industries across the district. Local cycles can be designed and controlled in a manageable sustainable way and are comparatively easy and democratically realizable through step-by-step procedures. The effectiveness of the measures in the establishment and operation of local cycles can also be assessed through rapid local feedback, so that such local cycles can be optimized with certainty of direction. The neighborhood therefore shows that there is interest in continuous improvement and increase with regard to the topics of sustainability, climate protection and efficiency, and that further neighborhoods can be productively developed and designed in the future. This opens up new opportunities for ecological urban development for the city of Dessau-Roßlau.

However, the organization of this project can be better designed in the future. The Urban Farm in Dessau proceeded according to the motto "Just do it", since there were few directly transferable reference projects or processes for such framework conditions in a shrinking city. The process and structure of the project are therefore rather unstructured and could be expanded for further projects of this kind. At the same time, however, it is a very illustrative project that shows how something can be created through praxis.

In summary, the "Urban Farm Dessau" project can be assessed as extremely positive since it is conceived in a citywide and systematic manner and is being tested both practically and concretely in the neighborhood. The decentralized energy production in the urban space is combined with the topic of urban repair and land upgrading. Energy production and urban agriculture are thus synergistically combined. The pictorial aspect of the project also distinguishes it. It is about showing what is planned, but above all how something can be implemented and thus made possible.

Recommendations for action for possibilities of transferability

Due to economic structural change, demographic change, declining population and employment figures, suburbanization processes and other reasons, the

number of brownfield sites in shrinking cities in Germany and abroad is continuing to rise without any foreseeable subsequent use or reuse.

In light of the 30-ha target, revitalization of these brownfield sites is crucial. Internal development should be promoted, and external development slowed down in order to reduce the amount of new land being used per day in Germany.

Other ecological developments, such as advancing air pollution, climate change and the extinction of many native animal and plant species, represent challenges that can be countered by the bioeconomic use of brownfields. The environment and resources must be conserved in the future. Through the project "GIAGEM" of the Technical University of Kaiserslautern in Germany and the Universidad de Guadalajara in Mexico, so-called "Green Innovation Areas" are investigated in cooperation, which represent new forms of use for brownfields. The aim is to find transferable projects that can address the current challenges of urban development in a bioeconomic way.

One of these projects is the "Urban Farm Dessau" project, which was described and evaluated in more detail previously. The question now arises as to what extent this project can be transferred to other cities. In the following, important recommendations for action are therefore made for the revitalization of brownfields through bioeconomic forms of use.

Preliminary investigation

In order to be able to realize such a project, a detailed preliminary investigation is required in advance. The upstream analysis of the project area, but also the approach, plays the main role. Parts of this can be transferred to other cities, but the majority of these preliminary investigations often depend on local conditions.

The methodical procedure and the involvement of various offices, companies and stakeholders depend on the respective administrative structure and the distribution of tasks within a city. It is essential that the actors cooperate with each other from the very beginning beyond their specialist areas and are always in contact with each other in order to promote the smooth running of the project.

Example projects cannot be directly transferred to every city, since very different population, social or urban structures often prevail, which have an influence on the respective project.

The financial strategy also plays an important role in brownfield revitalization. It also depends on the financial resources of the respective city as well as different foundations and funding programs on site. It is important here that projects are planned in such a way that the possibility of funding exists, for example through

the combination of federal or state funding programs, various foundations or also investments by local companies.

In addition, the acceptance of the project by the residents of the respective city or a neighborhood is of decisive importance. This can only be achieved through the active participation of the population. Participation in the entire planning process and, above all, the added value of the project for the respective neighborhood is particularly important.

Area reference

The basic procedure for such a project is transferable to other cities in its structure. However, the results of the analysis may differ in principle due to different local conditions.

The analysis of the infrastructure is crucial for determining which bioeconomic form of subsequent use would be possible at the respective location. The area and potential analysis also play an important role. The potential of an inner-city brownfield site must be examined. In the field of energy, for example, the energy resources wind, sun and water must be examined in order to ultimately find a suitable form of use. The existing situation at the site forms the basis for this. The design of an urban farm is generally dependent on climatic, topographical, and geographical conditions on site, as it combines a wide variety of areas of the bioeconomy. Some criteria are also interchangeable or can be supplemented by other points of investigation. The results of the analysis should be the prerequisites for the implementation of a project.

CONCLUSION

The number of inner-city brownfield sites continues to increase in German cities due to structural change and demographic change. It is important to revitalize these brownfields as part of the urban development strategy of reducing the need for new land by promoting inner-city development while at the same time putting external development on hold. Revitalization of brownfields can be implemented through many different options for subsequent use, which must be investigated and evaluated.

Within the framework of the project "GIAGEM" "Green Innovation Areas in Revitalizing German and Mexican Cities", the focus is on bioeconomic reuse as a form of revitalization of brownfields. The brownfields are to be used in such a

way that they contribute to sustainability, climate protection and economic viability.

The project "Urban Farm Dessau" is an optimal example for a bioeconomic reuse of brownfields. In this regard, a classification as well as a comprehensive analysis of the city of Dessau and the project area was carried out in order to determine local conditions. In addition, the general preliminary investigations of this project were examined more closely, which are essential for the implementation of such a project. The goal of the project is to test the approach and especially the implementation of an Urban Farm in the city in order to convince other neighborhoods and cities of this form of brownfield revitalization. The "Urban Farm Dessau" combines the food industry in connection with urban gardening with renewable energies and recycling as well as educational activities and facilities in order to give the neighborhood a new image and to upgrade it accordingly. Since this project needs a longer period of time to function as a comprehensive construct as an "Urban Farm" with all its pillars, it is of great importance to involve the residents and integrate them in the project process. The area as a neighborhood farm is better understood and accepted, as it also brings great added value to the neighborhood and the city. Accordingly, the Urban Farm is maintained and supported by the residents, but also tourists as well as many urban businesses, hotels or guesthouses that are linked in the entrepreneurial network.

In order to be able to implement urban farms in other cities, some framework conditions need to be better defined and concretized. For example, the various individual measures can be better conceptualized and tackled more quickly.

In conclusion, the "urban farm" certainly represents a revitalization opportunity in shrinking cities. It offers a comparatively low-cost alternative because, after initial funding, the project can be supported by its own income from sales of goods and services in the future. Furthermore, it offers the possibility to produce healthy food by oneself and to educate oneself in this field. Through the self-generated energy with the help of a biogas plant, solar cells and small-scale wind turbines, the neighborhood also becomes energy self-sufficient, which has a positive effect on the climate and also on resources. The young generation is also given the opportunity to get involved in a business and develop themselves through workshops, training and seminars. Through these aspects, the Urban Farm in the bioeconomic context represents a long-term efficient and sustainable subsequent use also in terms of future urban development.

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