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Management guidelines for a clay pit area in Poland based on an inventory of birds and a survey of public opinion

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Abstract: *Management guidelines for a clay pit area in Poland based on an inventory of birds and a survey of public opinion.* Recently, post-industrial sites have been identified as areas of ecological potential. All around the world projects are designed with a view to sustainable development. The aim is to create places where people can coexist harmoniously with the environment. Based on the assumption that a post-industrial area may be of high ecological value as well as attractive for recreation, we selected a former clay pit area in Poland with the aim of developing management guidelines that would focus particularly on these functions. To address this task, we carried out a bird inventory in the study area and a survey of public opinion. The results of our study confirmed that the area has the potential to provide both ecological values and possibilities for recreation. Future management should allow people to visit the area without deterioration of the natural values. Based on the results, management guidelines for the clay pit area were formulated.

Key words: clay pits, sustainable development, aves, public opinion, management guidelines

INTRODUCTION

When mass production disappeared from European cities, post-industrial areas arose as a new environment type. Many of these post-industrial areas were located close to water [Tölle 2010], due to the fact that steam engines needed water to work. New water areas originated from excavations, for example gravel or clay pits. Such areas were subject to different reclamation practices, for example as forest or water areas or for agricultural use [Kozłowski 1990].

However, reclamation goals changed with time. Beginning in the last decades of the 20th century, awareness arose that post-industrial areas offer numerous possibilities for nature conservation [Kelcey 1975, Johnson et al. 1978, Gillham and Smith 1983, Gemmell and Connell 1984, Rebele and Dettmar 1996]. Nowadays, a main principle of spatial planning in Europe is based on the idea of sustainable development [Chmielewski 2012]. A holistic approach to sustainable development is commonly accepted, focusing on the ecological, economic and socio-cultural components [Adams 2006]. An extensive analysis of several post-industrial areas in Poland and worldwide has shown that the management of such areas has to focus on various aspects such as water management, conservation and restoration of natural resources, environmental education and raising of awareness of cultural and historical matters, and the creation of leisure and recreation opportunities for visitors, with the aim of enabling harmonious coexistence between people and nature. Management costs should be kept low [Bihałowicz, unpublished].

Based on the assumption that a post-industrial area may be of high ecological value as well as attractive for recreation, we selected a former clay pit area in Poland with the aim of developing management guidelines that would focus particularly on these functions. To address this task, we carried out a bird inventory in the study area and a survey of public opinion.

Birds were chosen for the inventory because they are generally accepted as suitable bioindicators, for example with respect to ecosystem assessment, habitat changes, environmental contamination and restoration measures [Koskimies 1989, Roché et al. 2010]. Based on the species identified we planned to describe and assess the ecological values of the study area. The survey of opinion among visitors to the study area and inhabitants of Wołomin county was intended to study the degree of acceptance of the study area by visitors and the local population, as well as their recreational needs.

STUDY AREA

The study area (known as "Glinianki") is located within the territory of two towns, Zielonka and Kobyłka, in Wołomin county in Masovian Voivodship. The area has a total size of 60 ha (48 ha in Zielonka and 12 ha in Kobyłka). The area has allotments and a brickyard to the south-west, to the west it borders on housing and production areas, in the north-east it merges with agricultural fallow land, and the south-eastern border is marked by the Warsaw–Tłuszcz railway (Fig. 1).

The settlement of Zielonka was first mentioned in about 1885, although settlement in the area was already present in the Mesolithic period (8000–4000 BC) [Gutowski 2016]. In 1952 the Masovian Building Ceramics Factory (Mazowieckie Zakłady Ceramiki Budowlanej) began production, and clay pits emerged from the west to the east. Already in 1956 the resulting artificial ponds were stocked with fish by the Polish Fishing Association [Słowik 2016]. After the closure of the ponds for clay production, people began to use them as a recreational area, and this continues today.

Altogether four clay pits are located in the study area (Fig. 1), covering a total area of about 30 ha. The water level ranges between 3 and 5 m. The major part of the study area is crossed only by dirt tracks, which are impossible to use after rainfall. A small south-western part is accessible to visitors by a gravel path; this path is in poor condition, as are the garbage baskets and benches. There is also a workout trail with instruction boards. The training equipment is in good condition, but the instruction boards are damaged. The area contains several educational boards with information about its history and wildlife. In the south-western parts two beaches are located. The first is a grassy resting beach situated close to a parking place, equipped with a bicycle stand (in poor condition), a field gym and a small playground (in good condition), and portable toilets. The second is a sandy beach with a guarded public bathing place. Located nearby are a gym and a playground, in relatively good condition. There are a changing room and portable toilets, and two volleyball courts and a barbecue area are situated close by. At all of the clay pits one can find poorly preserved piers for fishing.

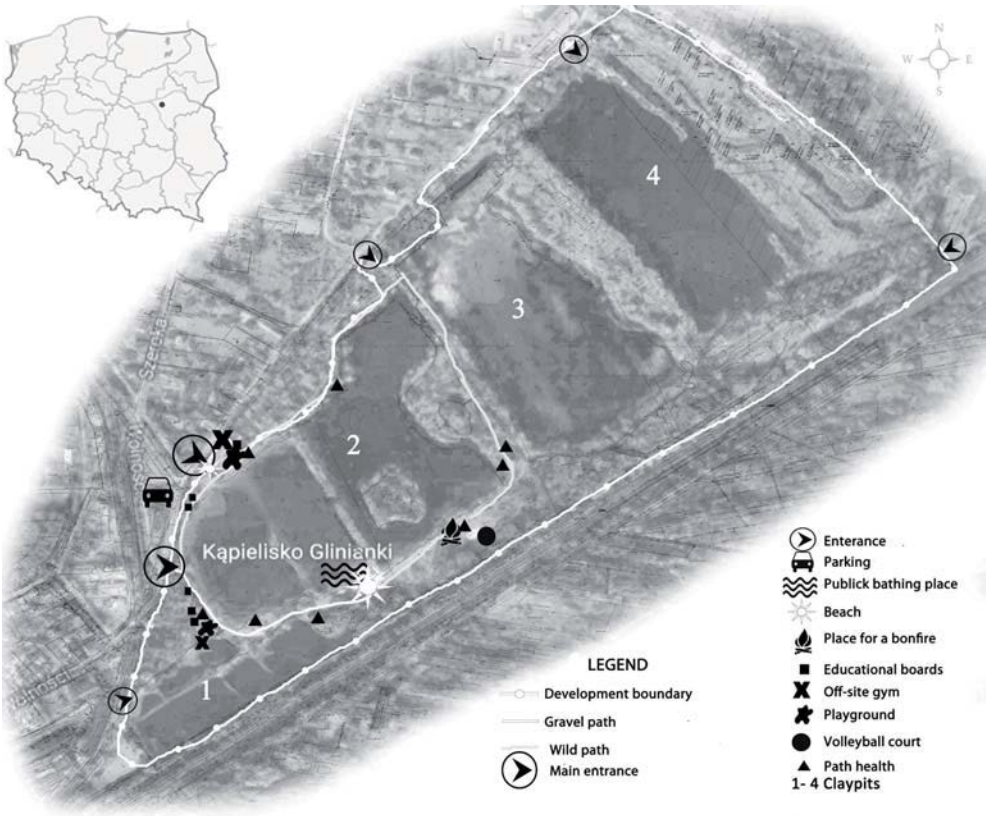

FIGURE 1. Map of the study area with the clay pits and the most important places and facilities indicated. The point on the small map (top left) indicates the location of the study area in Poland

METHODS

Field methods

The bird inventory was carried out to complement the 2013 inventory by Częścik et al. [2013]. Extensive surveys were carried out on 1 August 2016, 26 August 2016, 12 November 2016, 15 February 2017, 4 March 2017, 20 April 2017, 4 May 2017 and 11 June 2017. During these visits, at each pond, birds were identified by visual observation as well as by recognition of their calls, from an observation point, for at least one hour. Additionally, birds were recorded as the researcher walked through the area. These inventories were complemented by regular short visits to the study area from May 2016 to June 2017.

The opinion survey was carried out using a questionnaire (Appendix). The respondents were 60 inhabitants of Wołomin county, who completed the questionnaire online in December 2017, and 20 persons interviewed during field visits in May 2017.

Descriptive analysis of data

The identified bird species were classified as breeders (G) and guests (P). Species were considered as breeders if nest building and rearing of young was proven. The species were also classified by protection status: strictly protected (*ochrona gatunkowa*, OG), partly protected (*częściowa ochrona gatunkowa*, COG) or huntable (*gatunki łowne*, Ł) [Rozporządzenie Ministra Środowiska 2005, 2016]. A classification with respect to habitat preferences was made based on Dzienniak [2016] and Ekologia.pl [2017], the species being assigned to the following habitats: anthropogenic habitats (A), meadows (T), water habitats (W), and woods, forests and parks (Z).

With respect to the closed questions in the survey, we calculated the percentage share of each possible answer, in the case that only one answer was allowed. If more than one answer could be chosen, we calculated the total numbers of the respective answers. In the case of open questions the most important results were summarized.

RESULTS

During the bird inventory six bird species were detected which were not recorded in the bird inventory from 2013 [Częścik et al. 2013]. Thus, the list of bird species of the study area comprised 61 species (Table), of which 38 were verified as breeders. Also 54 species were classified as strictly protected, 3 species as partly protected, and 4 species as huntable. The greatest number of species were characterized as preferring woods, forests and parks (31 species), while 20 species preferred water habitats, 7 species preferred meadows, and 3 species preferred anthropogenic habitats.

The questionnaire was completed by 47 female (58.75%) and 33 male (41.25%) respondents. More than 75% of the respondents were between 19 and 40 years old (Fig. 2), and about 75% visited the area only once per month or less (Fig. 3). The most popular places within the area were the public bathing place and the resting beach (Fig. 4). Walking, bicycle riding and bathing were the dominant activities carried out by the visitors (Fig. 5).

Almost half of the respondents (48.75%) felt safe in the area, 30% did not feel safe, and 21.25% were undecided. Almost 80% (78.75%) considered the area to be of natural value and worth protecting, while 8.75% disagreed and 12.5% were undecided. Share of 58.75% of the respondents were interested in observing birds in the area, 10% were not interested and 31.25% were undecided.

The items of equipment most requested by the respondents were lamps and benches (Fig. 6). As additional facilities they proposed, amongst others, walking trails, a playground close to the bathing place, and toilets. As desirable additional attractions most respondents mentioned kayaks and pedal boats, a café with a pier at the waterside, and a volleyball court. The most negative aspects of the area were lack of lighting, inadequate management, the presence of persons consuming alcohol, and ubiquitous waste. Some of the respondents' comments concerning their expectations of the area were as follows: "a clean green area where you can enjoy bathing

TABLE. Alphabetical list of species detected at the clay pits in Zielonka, with information on type of presence (G – breeder, P – guest), protection status (OG – strictly protected, COG – partly protected, Ł – huntable species) and preferred habitats (W – water habitats, T – meadows, Z – woods, forests and parks, A – anthropogenic habitats). Species not mentioned in Częścik et al. [2013] are printed in bold

Species	Type of presence	Protection status	Habitat
1	2	3	4
Accipiter gentilis	P	OG	Z
Acrocephalus arundinaceus	G	OG	W
Acrocephalus schoenobaenus	P	OG	W
Alauda arvensis	G	OG	T
Alcedo atthis	G	OG	W
Anas platyrhynchos	G	Ł	W
Anthus campestris	G	OG	T
Apus apus	P	OG	A
Ardea cinerea	**P**	**COG**	**W**
Bombycilla garrulus	P	OG	Z
Botaurus stellaris	G	OG	W
Buteo buteo	**G**	**OG**	**Z**
Carduelis carduelis	G	OG	Z
Carduelis spinus	G	OG	Z
Ciconia ciconia	P	OG	T
Circus aeruginosus	P	OG	W
Columba palumbus	G	Ł	Z
Corvus frugilegus	P	COG	Z
Corvus monedula	P	OG	Z
Coturnix coturnix	G	OG	T
Crex crex	G	OG	T
Cygnus olor	G	OG	W
Delichon urbicum	**P**	**OG**	**A**
Dendrocopos major	P	OG	Z
Dryocopus martius	P	OG	Z
Emberiza citrinella	G	OG	T
Emberiza schoeniclus	G	OG	W
Fringilla coelebs	P	OG	Z
Fulica atra	G	Ł	W

TABLE, continued

1	2	3	4
Gallinula chloropus	G	OG	W
Garrulus glandarius	G	OG	Z
Hippolais icterina	G	OG	Z
Ixobrychus minutus	G	OG	W
Lanius collurio	G	OG	Z
Larus canus	P	OG	W
Larus ridibundus	G	OG	W
Locustella luscinioides	G	OG	W
Luscinia luscinia	G	OG	Z
Motacilla alba	G	OG	Z
Muscicapa striata	G	OG	Z
Oriolus oriolus	P	OG	Z
Parus caeruleus	G	OG	Z
Parus major	G	OG	Z
Passer montanus	P	OG	Z
Passer domesticus	G	OG	A
Phasianus colchicus	**P**	**Ł**	**T**
Pica pica	G	COG	Z
Picus viridis	P	OG	Z
Porzana porzana	G	OG	W
Pyrrhula pyrrhula	G	OG	Z
Remiz pendulinus	P	OG	W
Riparia riparia	**G**	**OG**	**W**
Sitta europaea	G	OG	Z
Sterna hirundo	P	OG	W
Sturnus vulgaris	G	OG	Z
Sylvia atricapilla	P	OG	Z
Sylvia curruca	P	OG	Z
Turdus merula	G	OG	Z
Turdus philomelos	G	OG	Z
Turdus pilaris	**G**	**OG**	**Z**
Vanellus vanellus	P	OG	W

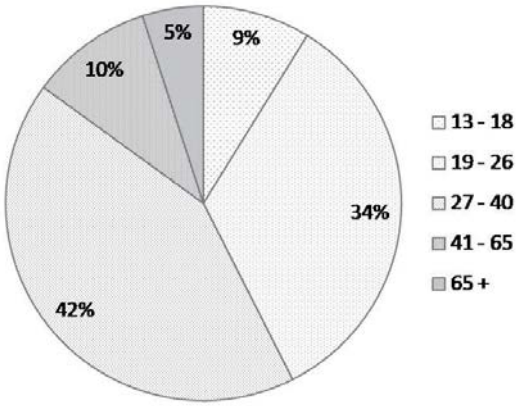

FIGURE 2. Breakdown of respondents by age range (ages in years)

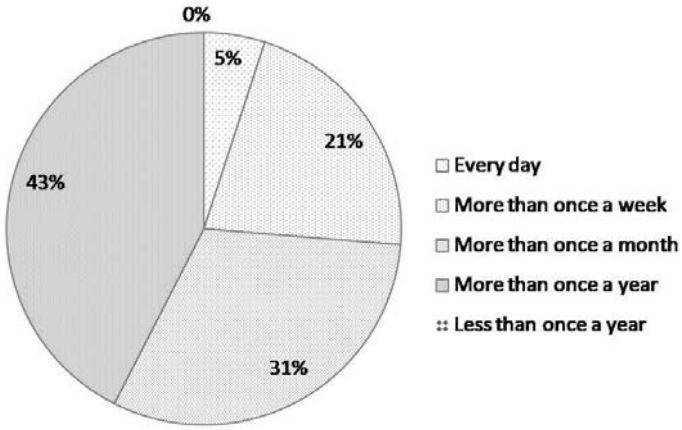

FIGURE 3. Respondents' frequencies of visits to the research area

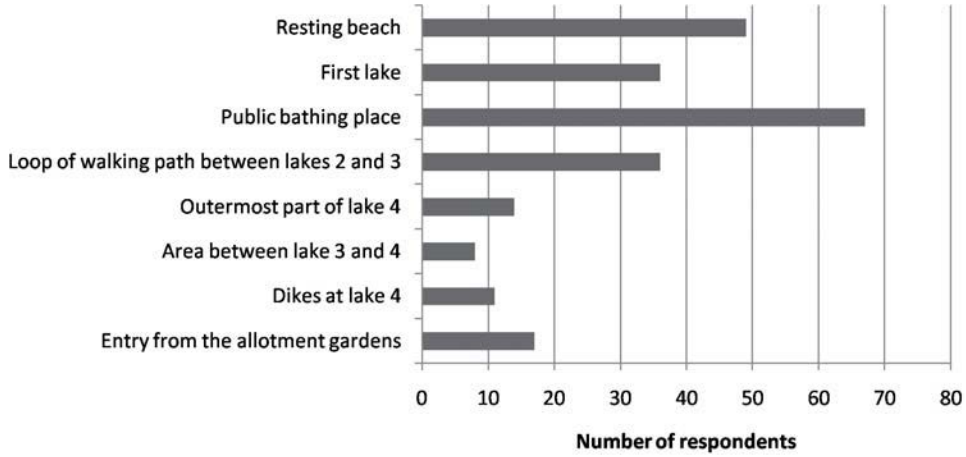

FIGURE 4. Numbers of respondents declaring that the respective places within the research area were most often visited

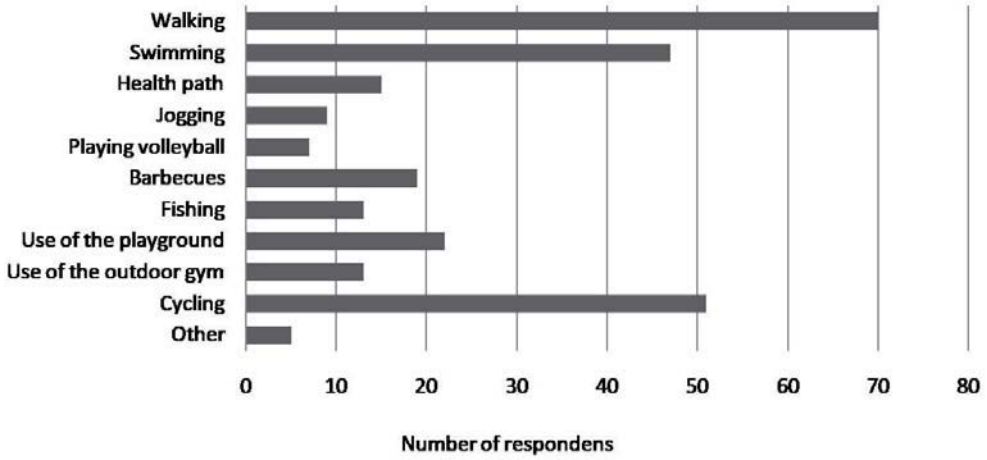

FIGURE 5. Numbers of respondents declaring that they use the research area for the respective activities

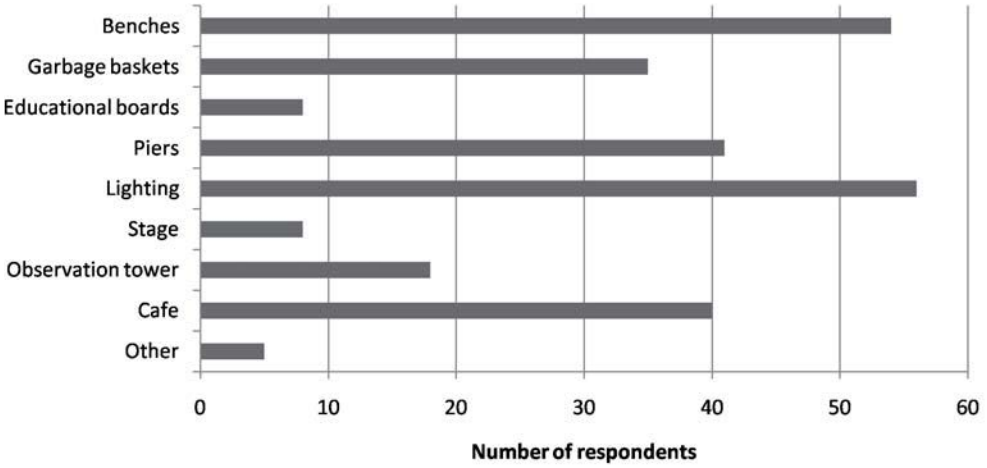

FIGURE 6. Numbers of respondents declaring that the respective types of equipment are needed in the research area

as well as contact with nature"; "the area has very high potential, it is possible to create new places for leisure activities, of which Zielonka does not have too many"; "to attract tourists the area has to be cleaned all year round and reasonably managed without destroying the nature"; and "active leisure and feeling safe".

DISCUSSION AND MANAGEMENT GUIDELINES

A remarkable result is the high number of breeding bird species in the study area. This implies a need to manage the area in such a way that during the breeding season the level of disturbance is kept low.

Studies on brown pelicans in the Gulf of California [Anderson and Keith 1980] and water fowl in a quarry pond in Germany [Putzer 1983] have indicated that even low disturbance frequencies may affect the presence and breeding success of the species. Therefore, it might be recommended to exclude some parts of the study area from regular recreational tourism. Moreover, the birds prefer various types of habitat, implying that the habitat diversity in the study area must be maintained or, if possible, increased. However, given that more than half of the area is covered by expanses of water, the number of birds associated with water habitats was lower than expected. It might be reasonable to increase the quantity of reed vegetation along the shorelines. Of particular interest among the identified bird species is the little bittern (*Ixobrychus minutus*), which is recorded in the Red List Data Book of Poland as "vulnerable" [Głowaciński 2002].

Due to the limited number of respondents (80) the survey should be considered rather as a preliminary one. However, several conclusions can be drawn. A noticeable feature is that persons in the 19–40 age range are dominant. This might indicate that older people visit the area relatively rarely. However, the majority of the respondents answered the survey online, and it is likely that this is in fact the reason for the age distribution. An important finding is that 30% of the respondents did not feel safe in the area. Accordingly, visitors attached high importance to the improvement of equipment such as lighting and benches. It can be expected that improved lighting may reduce the numbers of people feeling unsafe, at least during early and late hours. Adequate provision of benches may be important to increase the number of older people visiting the area. Restaurant facilities and an adequate amount of toilets, as mentioned by the respondents, may complement the recreational needs.

Even if high percentages of respondents recognized the natural values of the area and declared an interest in bird watching, a basic problem seems to be the large amount of waste in the area. Thus, there still seems to be a need to improve the sensitivity of some visitors to the natural and esthetical values of the area. Educational trails with information boards might be one possible way to increase environmental awareness [Bogdanowicz et al. 2014].

Water recreation is of particular interest to visitors. However, activities such as kayaking and pedal boating increase the risk of damaging the shorelines, which often constitute ecotones that are sensitive to touristic activities [Skłodowski et al. 2006, Skłodowski 2009]. Special care has to be taken to avoid uncontrolled damage of the shorelines and disturbance of the waterfowl, and also to avoid unnecessary repair costs.

The results of our study confirmed that the area has the potential to provide both ecological values and possibilities for recreation. Future management should allow people to visit the area without deterioration of the natural values. Therefore, we recommend the following management guidelines for the clay pits in Zielonka:

- Harmonious coexistence of people and nature.
- Protection of the landscape and habitats.

- Environmental education through educational boards and learning through play.
- Creation of recreation and resting places for all age groups.
- Low maintenance costs.
- Creation of diverse habitat types in order to increase biodiversity.
- Leaving of some places inaccessible or difficult to access by dividing the area into two differently managed zones.
- Enabling of recreational use of the water by means of piers and pedal boats.
- Provision of places for various types of leisure, including passive leisure, sports, bathing and fishing.
- Provision of basic equipment in appropriate quantities, especially benches.
- Modeling of the shoreline to increase opportunities for water recreation and habitat diversity.
- Concentration of visitors in one part of the area only, through appropriate management.
- Provision of restaurant and sanitary facilities.

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Streszczenie: *Wytyczne dotyczące zagospodarowania terenu glinianek w Polsce, opracowane na podstawie spisu ptaków i badania opinii publicznej*. Ostatnio uznano teren postindustrialny za obszary o potencjale ekologicznem. Na całym świecie projektuje się obiekty pod kątem zrównoważonego rozwoju. Celem tych działań jest stworzenie harmonijnych miejsc współistnienia ludzi i środowiska. Na podstawie założenia, że obszar poprzemysłowy może mieć dużą wartość ekologiczną, a także może być atrakcyjnym miejscem rekreacji, autorzy wybrali tereny powstałe po wydobyciu gliny w Polsce w celu opracowania wytycznych zagospodarowania, które powinny koncentrować się przede wszystkim na tych funkcjach. Aby poradzić sobie z tym zadaniem, przeprowadzono inwentaryzację ptaków w obszarze badań oraz badanie opinii publicznej. Wyniki badania potwierdziły, że obszar ten ma potencjał, aby służyć zarówno wartościom ekologicznym, jak i możliwościom rekreacji. Przyszłe zagospodarowanie powinno umożliwić ludziom odwiedzanie obszaru bez pogorszenia się walorów przyrodniczych. Wytyczne zagospodarowania glinianek zostały opracowane na podstawie wyników analiz.

APPENDIX. Survey questionnaire (English translation from Polish)

Glinianki in Zielonka

I am a student of landscape architecture at Warsaw University of Life Sciences – SGGW. I am writing a master's degree thesis on the topic "The transformation of postindustrial sites into areas with recreational and ecological functions, on the example of the Glinianki in Zielonka." The survey will take only a few minutes, but may help to change the image of the area.

Top of form

Preliminary questions

Please indicate your sex. *
Tick only one answer.
- o Female
- o Male

Please indicate your age range. *
Tick only one answer.
- o 13–18
- o 19–26
- o 27–40
- o 41–65
- o 65+

Are you an inhabitant of Wołomin county? *
Tick only one answer.
- o Yes, go to question 4.
- o No, go to "Thank you for your participation in the survey."

How often do you visit the Glinianki? *
Tick only one answer.
- o Every day
- o More than once a week
- o More than once a month
- o More than once a year
- o Less than once a year, go to "Thank you for your participation in the survey."

Detailed questions

How do you use the Glinianki?
Tick all appropriate answers.
- o Walking
- o Swimming
- o Health path
- o Jogging
- o Playing volleyball
- o Barbecues
- o Fishing
- o Use of the playground
- o Use of the outdoor gym
- o Cycling
- o Other:

Where do you most often go in the area?

Tick all appropriate answers.
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6
- o 7
- o 8
- o Other:

Do you think that the area is safe?
Tick only one answer.
- o Yes
- o No
- o Maybe

Which equipment should be in the area?
Tick all appropriate answers.
- o Benches
- o Garbage baskets
- o Education boards
- o Piers
- o Lighting
- o Stage
- o Observation tower
- o Café
- o Other:

Which attractions should be offered at the Glinianki? E.g. kayaks, sports courts

Do you consider this place to be naturally valuable?
Tick only one answer.
- o Yes
- o No
- o Maybe

Would you like to observe birds in their natural habitat?
Tick only one answer.
- o Yes
- o No
- o Maybe

What disturbs you most at the Glinianki? E.g. noise, lack of lighting

What do you expect from this area?

*Required