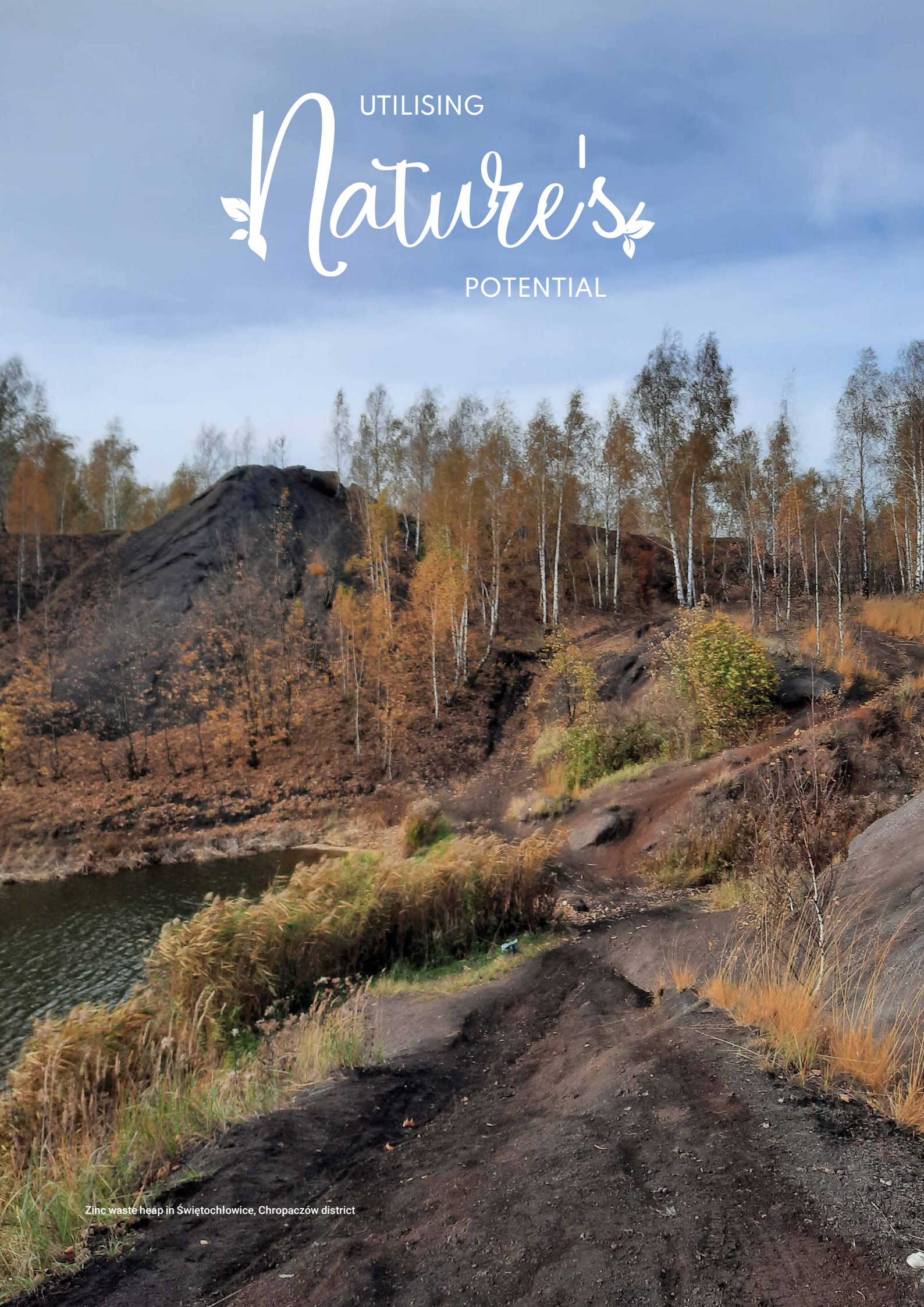
UTILISING Nature's POTENTIAL



Zinc waste heap in Świętochłowice, Chropaczów district

Greenery cultivated and managed by people tends to dominate in cities. It covers lawns, squares, parks, gardens, and communal gardens, which serve various functions, among others: biological, hydrological, climate, and aesthetic. We are quick to skip over unmanaged greenery. These are plant communities in wastelands, roadsides, post-industrial areas, and post-mining waste heaps. To most people, such areas might seem neglected, abandoned, and in dire need of intervention and proper management. Nothing could be further from the truth!

CITY AS AN ECOSYSTEM

Cities are ecosystems, which means that they are ecological units made up of many different organisms and various elements of inanimate nature found within it. Living organisms and inanimate elements of the environment influence each other. Water, temperature, sunlight, terrain, including roads, bridges, and houses, have a significant impact on the distribution and living conditions of wildlife species in cities. Their ecosystems differ significantly from other ecosystems in terms of the natural processes taking place within them. The fundamental difference results from the fact that cities are constructed to serve only one species – humans, who manage natural environments in such a way as to serve exclusively their own needs.

'Cities and their ecosystems are a mosaic, a combination of various more or less transformed habitats – from natural and semi-natural to heavily degraded', says Agnieszka Kompała-Bąba, PhD, DSc, Associate Professor, a biologist from the Faculty of Natural Sciences of the University of Silesia who conducts research on plants in urban environments. 'We are used to urban greenery cultivated according to the common guidelines of gardening; we tend to prefer harmonious and symmetrical forms. Meanwhile, nature abides by its own rules. It knows which species will thrive in a given location, and making use of this knowledge can help us effectively shape and contribute to the creation of an urban ecosystem friendly to all species. Contrary to what we might expect, such approach to urban development will result in a significant improvement to the living conditions of humans.

Most people associate unmanaged greenery in urban spaces with weeds that need to be removed. Those plants often grow over transformed habitats, such as roadsides, surroundings of old buildings, garbage dumps, construction sites, workplaces, factories, and various post-industrial sites. It's not hard to imagine that these areas are not all that attractive for residents. However, they are very important! Plants affect all places they enter, they influence the environments and bring many benefits, which we do not usually notice at the first glance, and consequently do not appreciate. Firstly, they consolidate the ground and protect against water and wind erosion. Some species can grow in areas with increased concentration of heavy metals, while others in extremely dry locations or places lacking in nutrients. In such spaces, plants create various interesting combinations, often different from those which we know from parks and gardens, and they are better adapted to the conditions they encounter in a given place.

Żabie Doły nature and landscape complex in Bytom

Silesia and Zagłębie are both very specific regions. They mostly consist of industrial, heavily transformed, and degraded areas. The problems do not end just with the aesthetic aspects, even though they can also have a significant impact on the investment value of those areas. Far more serious are the health and safety risks resulting from environmental pollution and climate change, air, soil, and surface water pollution, as well as cities full of concrete that disrupts water management. This becomes apparent when we take into account the increasingly frequent floods after heavy rains. Fortunately, semi-natural habitats, i.e. meadows, grasslands, and forest communities, are also present in some transformed areas, such as quarries and post-mining waste heaps. The plants which enter onto wastelands and post-industrial areas often create picturesque systems. These are ruderal plants growing on terrains transformed by humans, urban spaces in particular, e.g. buildings and their near vicinity, roads and roadsides, railway areas, car parks and squares, landfills post-mining waste heaps, and post-industrial areas. Segetal weeds appear in their vicinity. The seeds that grow into poppies, cornflowers, or the beautifully flowering blueweed are often carried with fertilized materials.

Zielona Park in Dąbrowa Górnicza serves as an interesting example. It was created thanks to the construction of the road to Łagisza in 1931 that connected the area with the city centre. In 2008, an ecological site Uroczysko Zielona was established to protect the mixed oak-hornbeam forest community there. The tree population includes hornbeams, small-leaved limes and pedunculate oaks, maples, and in the undergrowth the wood anemone, yellow anemone, common hepatica, lesser celandine and, a little later in the year, the wild garlic bring about the beautiful colours of spring. There is also a pond that serves as a place for amphibians to reproduce and a habitat for birds and muskrats, as well as many interesting plants growing that grow in it, such as water soldiers and water lilies. Therefore, not only does the Zielona Park perform recreational functions but it also retains its natural qualities.

Another example of spectacular revitalisation is Silesian Park in Chorzów, one of the largest parks in Europe (spanning nearly 600 ha). It was established on post-industrial areas: post-mining waste heaps, illegal shallow coal mines, sinkholes, landfills, as well as wastelands. The decision to build the park came in 1951. On the one hand, it is now a cultural and recreational space with a football stadium, zoo, amusement park, and a planetarium, but on the other, it is still a wild area with several meadows and a forest. Initially, only fast-growing, pollution-resistant tree species were introduced, but other forest species were later added as well. Currently, the Park is referred to as the green lungs of the Upper Silesia region and serves hikers, families, and those engaged in sporting activities. Unfortunately, the incredibly strong pressure from developers and intensive infrastructure expansion inside the park over the last few years has led to the degradation of green areas within this highly valuable site and development of neighbourhoods in its vicinity. The green oasis in the middle of the Upper Silesian conurbation of several million people in the most industrialised region of the country should be given adequate protection to ensure a better quality of life.

Another example worth mentioning is the Żabie Doły nature and landscape complex in Bytom. It is a green oasis overgrown with ruderal communities and rushes inhabited by numerous birds. Water fills the sinkholes created as a result of zinc-lead ore processing and land subsidence caused by coal mining done at the Barbara-Chorzów mine. There are also tailings pits formed as a result of zinc and lead ore processing at the Orzeł Biały mining and smelting works. Today, there is no longer any industry there, no infrastructure or narrow-gauge railway that once crossed the Żabie Doły area. Nowadays, due to its wetland character, it is an extremely valuable area waiting to receive the nature reserve status.

Often we do not realise that the tailings pits or waste heaps can be considered an 'ecological bomb'. The material that has accumulated there is washed out and gets into the water and soil – it reacts, and if it were not for the plants that can bind the substrate and extract heavy metals from it, it would certainly pose a great risk to our lives and health. For this reason, colonising wastelands play a crucial role in cleaning up the area. In addition, we mustn't forget that other organisms – birds and amphibians – follow the plants and enter the system, affecting biodiversity.

'Nature researchers call such new systems emerging on post-industrial sites novel ecosystems', the scientist explains. 'Those novel ecosystems show us how to properly develop post-industrial sites. It is a good idea to take a page from nature's playbook on how to use natural processes during land reclamation. We study soils and places covered by spontaneous vegetation to find out how a chain of relationships is formed which then provides us various ecosystem services, such as improved ground and air quality, water retention, aesthetic value, and places to relax – all of which are extremely important.

Post-industrial areas frequently include bodies of water created by land subsidence, i.e. sinkholes or subsidence basins, some of which have filled with water. For years, the prevailing opinion was that these types of objects should be filled in with waste rock, but nature researchers have shown that with time these places become inhabited by interesting plant and animal species and, as a result, the diversity of the area increases. In addition, those kinds of sinkholes are valuable water reservoirs and can be used during fire-fighting operations. In Silesia, there is a great number of flooded sinkholes, which can be referred to as the Upper Silesian Reservoir district.

Some plants have adapted to the urban heat island. These are often species that originate from warmer Mediterranean zones, such as the wall barley or little lovegrass. It is worth noting that climate change brings along invasive plant species, which pose a threat to the environment over time. They have many important characteristics that distinguish them from native species. First of all, they have no natural enemies in our country and are able to adapt to an extended growing season. Non-native plants often start blooming later than native species, they are taller, and have larger and more colourful flowers. This can make them more attractive to pollinators. In addition, they often secrete oils and pollens that cause allergies and even toxic compounds causing burns, such as Sosnowsky's hogweed.

The city modifies the environment. The climate is drier and temperatures are higher than in suburban areas. The ground contains a great deal of foreign materials sealing the surface, including concrete, elements of reinforcement, and asphalt. The layout of urban development impacts winds and temperatures, and by developing the so-called air corridors we have completely disrupted urban air circulation. Now we are looking for solutions, even in the form of small clumps of trees, pocket parks, or de-retrofitting squares and introducing lawns instead. In such places, the temperature tends to be lower and the humidity higher: this should be the direction of urban development to ensure a better quality of life for all.

Nature's potential in regenerating transformed areas should also be explored. Spontaneous or assisted succession makes it possible to restore or create ecosystems in a better way than just incorporating artificial systems created in the reclamation process. Obviously, the conditions are different on post-mining, post-zinc heaps, sand pits, and quarries, but post-industrial sites offer enormous possibilities for increasing biodiversity. We should let nature take its course, as it is capable of regenerating virtually everything and provides us with wise suggestions on how we can regenerate degraded areas.

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Novel ecosystems on a post-mining waste heap

Wild garlic at the Zielona Park in Dąbrowa Górnicza