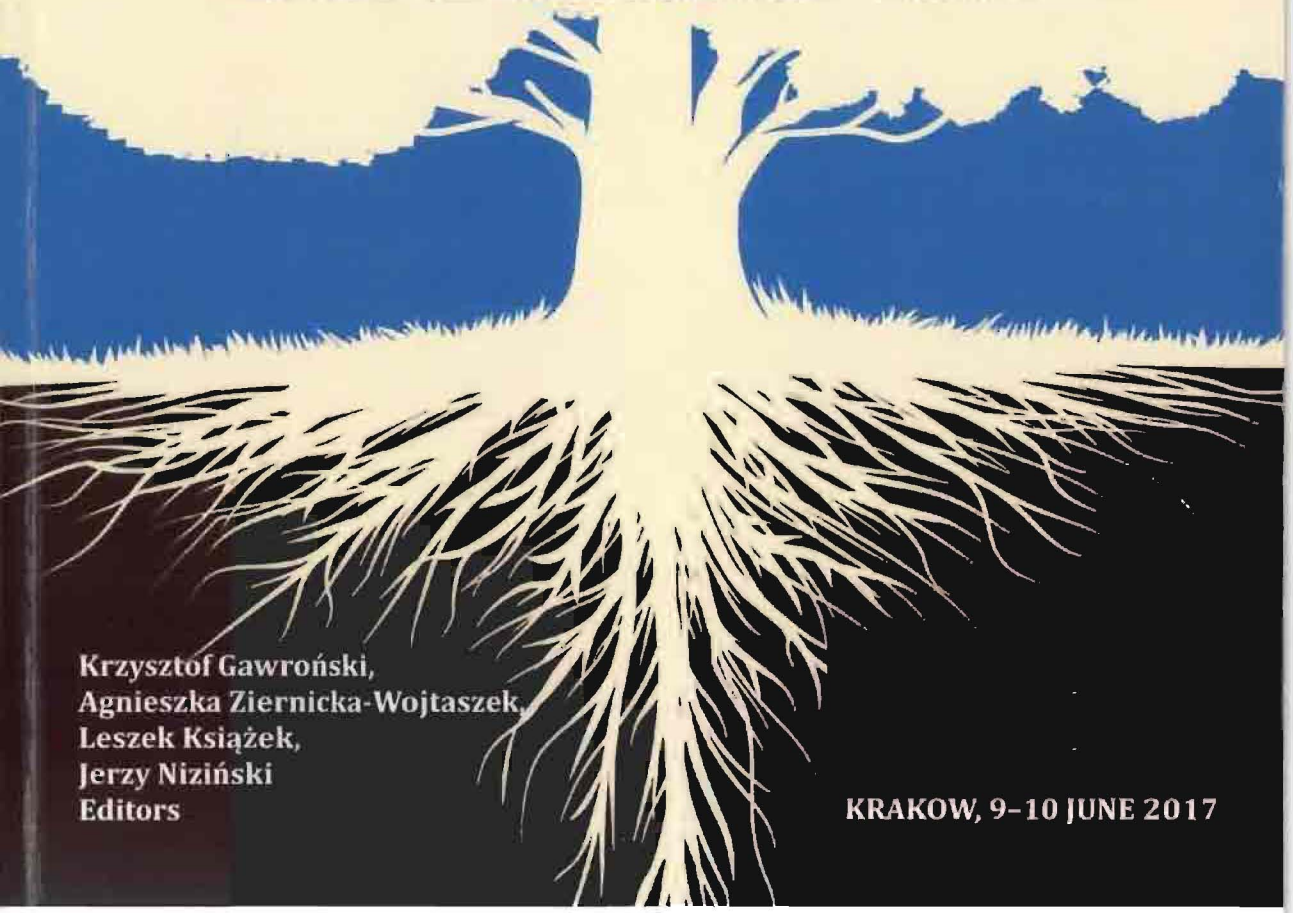
Proceedings of the third Ecoscience Workshop

ECOLOGY AND ENVIRONMENTAL SCIENCE – REDUCTION OF WATER STRESS AND ADAPTATION TO ARIDITY

FACULTY OF ENVIRONMENTAL ENGINEERING AND LAND SURVEYING,
UNIVERSITY OF AGRICULTURE IN KRAKOW, POLAND



Krzysztof Gawroński,
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Spis treści
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Słowo wstępne
Introduction

Organizowane przez nas Warsztaty „Ekologia i Nauki o Środowisku" są trzecim spotkaniem po pierwszej edycji z marca 2012: „Problèmes actuels de la protection contre les inondations" Paris-Orléans oraz drugiej edycji z listopada 2015: „Sciences de l'Environnement" Paris-Bondy. Tematyka konferencji obejmować będzie szeroko rozumiane obszary badań z zakresu nauk o środowisku: ekologii, klimatologii, hydrologii, gospodarki wodnej, gleboznawstwa, fizjologii roślin i nauk rolniczych. W szczególności będzie dotyczyła przyrodniczych, rolniczych i technicznych aspektów obiegu energii i wody w atmosferze, na powierzchni ziemi, w profilu glebowym i w roślinie. Uwzględnione zostaną realia współczesnych zmian klimatu, aktualne trendy renaturyzacyjne, a także integracja obowiązujących aktów prawnych z wymaganiami i dyrektywami Unii Europejskiej.

Nasze Warsztaty „Ekologia i Nauki o Środowisku" odbedą się w ramach jubileuszu 100-lecia Stowarzyszenia Inżynierów i Techników Polskich we Francji.

Organizatorem Warsztatów jest Wydział Inżynierii Środowiska i Geodezji Uniwersytetu Rolniczego w Krakowie wraz ze Stowarzyszeniem Inżynierów i Techników Polskich we Francji, ze Stacją Naukową Polskiej Akademii Nauk w Paryżu oraz Institut de Recherche pour le Développement z Francji, pod patronatem Polskiej Akademii Nauk, Ambasady Republiki Francuskiej w Warszawie i Europejskiej Federacji Polonijnych Stowarzyszeń Naukowo-Technicznych.

Nasze Warsztaty zostały zainspirowane między innymi umową „strategicznego partnerstwa polsko-francuskiego" Programu Współpracy polsko-francuskiej podpisanej w Warszawie 29 listopada 2013 r. przez przedstawicieli ministrów odpowiedzialnych za sprawy europejskie. W szczególności w rozdziale IX pt. „Współpraca w dziedzinie edukacji, badań naukowych i kultury" w punktach 2, 5 i 7 wskazuje się na konieczność: pkt 2. wzmocnienia polsko-francuskiej współpracy poprzez mobilność naukowców między dwoma krajami; pkt 5. rozwoju i wzmocnienia wspólnych dyplomów, zwłaszcza w dziedzinie naukach ścisłych, a w naszym przypadku nauk o środowisku, wzrostu liczby doktoratów pod wspólną kontrolą; pkt 7. intensyfikacji wielostronnej współpracy akademickiej i programów europejskich z rozbudową programów w krajach sąsiednich.

Celem Warsztatów jest realizacja wspólnych programów; każda ze stron może przyjąć studentów, doktorantów i doświadczonych pracowników naukowych z krajów partnerskich. Ten rodzaj współpracy powinien doprowadzić do wzrostu publikacji zespołów badawczych, wzrostu liczby wspólnych doktorantów, uczestnictwa w komitetach przewodów doktoranckich i habilitacyjnych, a także umożliwić wspólne poszukiwania naukowe w Egipcie, w Rumunii, w Tunezji i na Ukrainie.

Komitet organizacyjny:

dr hab. inż. Agnieszka Ziernicka-Wojtaszek (Przewodniczący), dr hab. inż. Leszek Książek, dr hab. inż. Jerzy J. Niziński, mgr inż. Lucjan Sobkowiak, prof. dr hab. Marek Więckowski, dr inż Jerzy Grela, mgr inż. Janusz Ptak, dr inż. Agnieszka Woś, dr. inż. Maciej Wyrębek, dr inż. Zbigniew Zuśka, mgr inż. Joanna Krużel (Sekretarz)

Foreword

Our Workshop, "Ecology and Environmental Science", is the third such meeting, after the first edition in March 2012: "Current problems of flood protection" (in Paris-Orléans) and the second edition in November 2015: "Environmental Sciences" (in Paris-Bondy). Topics of the conference will include broadly understood areas of research in environmental sciences: ecology, climatology, hydrology, water management, soil science, plant physiology and agricultural sciences. In particular, it will concern the natural, agricultural and technical aspects of energy and water circulation in the atmosphere, on the ground, in the soil profile and in plants. The realities of contemporary climate change, current nature restoration trends, as well as the integration of existing legislation with the requirements and directives of the European Union will be taken into account.

Our Workshop on "Ecology and Environmental Science" will be held as a part of the 100th anniversary celebration of the Association of Polish Engineers and Technicians in France.

The workshop is organized by the Faculty of Environmental Engineering and Land Surveying of the University of Agriculture in Kraków, together with the Association of Polish Engineers and Technicians in France, with the Science Station of the Polish Academy of Sciences in Paris, and the Institut de Recherche pour le Développement in France, under the auspices of the Polish Academy of Sciences, Warsaw and the European Federation of Polish Scientific and Technological Associations.

Our workshops were inspired by, among other things, the "Polish-French Strategic Partnership" agreement of the Polish-French Cooperation Program, signed in Warsaw on 29 November 2013 by representatives of ministers in charge of European affairs. In particular, in Chapter IX regarding the "Cooperation in the fields of education, research and culture" in points 2, 5 and 7, stresses the need to: 2) strength-

en Polish-French cooperation through the mobility of researchers between the two countries; 5) develop and strengthen joint diplomas, especially in the field of science, and in our case environmental sciences, increasing the number of doctorates under joint control; 7) intensify multilateral academic cooperation and European programs with extension to building programs in neighbouring countries.

The aim of the Workshop is the implementation of joint programs, whereas each of the parties could accept students, both undergraduate and doctoral, as well as experienced researchers from partner countries. This kind of cooperation should lead to an increase in the numbers of publications by research teams, an increase in the number of joint doctoral students, participation in doctoral and habilitation committees, and joint scientific research in Egypt, Romania, Tunisia and Ukraine.

Organizing committee:

dr hab. inż. Agnieszka Ziernicka-Wojtaszek (Chairperson), dr hab. inż. Leszek Książek, dr hab. inż. Jerzy J. Niziński, mgr inż. Lucjan Sobkowiak, prof. dr hab. Marek Więckowski, dr inż Jerzy Grela, mgr inż. Janusz Ptak, dr inż. Agnieszka Woś, dr. inż. Maciej Wyrębek, dr inż. Zbigniew Zuśka, mgr inż. Joanna Krużel (Secretary)

Introduction

Notre Atelier « Ecologie et Sciences d'Environnement », c'est la troisième rencontre après celle de mars 2012 « Problèmes actuels de la protection contre les inondations » (Paris-Orléans) et celle de novembre 2015 « Sciences de l'Environnement » (Paris-Bondy).

L'Atelier couvrira de vastes domaines de la recherche dans le domaine des sciences de l'environnement : l'écologie, la climatologie, l'hydrologie, la gestion de l'eau, la science du sol, la physiologie des plantes et des sciences agricoles, en particuliers, la circulation de l'énergie et de l'eau dans l'atmosphère au niveau du couvert dans le profil du sol et dans la plante. Prendra en compte les réalités du changement climatique d'aujourd'hui, les tendances actuelles restauration et l'intégration de la législation existante aux exigences et aux directives de l'Union européenne.

Cet atelier « Ecologie et sciences de l'environnement » sera organisé dans le cadre du jubilé du 100^{e} anniversaire de l'Association des ingénieurs polonais et techniciens en France.

L'organisateur est le Département de génie de l'environnement et de géodésie, l'Université de l'Agriculture à Cracovie en partenariat avec l'Association des ingénieurs et techniciens polonais en France, ainsi qu'avec l'Académie Polonaise des Sciences à Paris et l'Institut de Recherche pour le Développement en France.

Cet atelier a été conçu, entre autre, dans le cadre de la convention « Partenariat stratégique franco-polonais - Programme de coopération - chapitre IX: Coopération dans les domaines de l'éducation, de la recherche, de la culture, points 2, 5

et 7 », signée à Varsovie le 29 novembre 2013, par les Ministres délégués auprès du Secrétaire d'Etat du Ministre des Affaires étrangères en charge des Affaires européennes de la République française et de celui de La Pologne. Cet atelier doit déboucher sur la mise en place de programmes communs; chacun des participants pourra recevoir les étudiants, les post-doctorants et les chercheurs des pays partenaires.

L'objectif de l'atelier est d'intégrer des spécialistes des sciences l'environnement, de promouvoir les échanges d'expérience scientifique, de créer un cadre de coopération sur les questions relatives aux sciences de l'environnement, y compris l'utilisation de ces contacts dans l'enseignement, de l'ingénierie d'environnement et à la protection d'environnement.

Cet atelier doit déboucher sur la mise en contact des participants : cette collaboration devrait se traduire par l'amplification des taux de publications chez nos chercheurs, par l'augmentation du nombre d'étudiants en cotutelle et par des recherches communes avec l'Egypte, Roumanie, Tunisie et Ukraine.

Le comité d'organisation

dr hab. inż. Agnieszka Ziernicka-Wojtaszek (Président), dr hab. inż. Leszek Książek, dr hab. inż. Jerzy J. Niziński, mgr inż. Lucjan Sobkowiak, prof. dr hab. Marek Więckowski, dr inż Jerzy Grela, mgr inż. Janusz Ptak, dr inż. Agnieszka Woś, dr. inż. Maciej Wyrębek, dr inż. Zbigniew Zuśka, mgr inż. Joanna Krużel (Secrétaire)

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BALICKA 253C, 30-149 KRAKÓW

9–10 JUNE 2017

PROGRAMME

9 June, Friday

8.00–9.00	REGISTRATION / WELCOME COFFEE
9.00–9.30	OPENING SESSION AND OFFICIAL WELCOME
9.30–10.45	SESSION 1 – PRESENTATION OF PARTNERS
10.45–11.00	COFFEE BREAK / NETWORKING
11.00–12.15	SESSION 2 – PRESENTATION OF PARTNERS
12.15–13.30	LUNCH AT THE MANOR HOUSE OF THE UNIVERSITY OF AGRICULTURE IN KRAKOW
13.30–14.30	SESSION 3 – PRESENTATION OF PARTNERS
14.30	COFFEE BREAK / NETWORKING

14.45–15.30 SESSION 4 – POSTER SESSION – YOUNG SCIENTISTS

15.30–16.30 SESSION 5 – IMPLEMENTATION OF R&D PROJECTS – CASE STUDIES

16.30–17.30 DISCUSSION / CONCLUSIONS / FUTURE PROSPECTS

19.00 CONFERENCE DINNER

10 June, Saturday

8.00 STUDY TRIP – PIENINY NATIONAL PARK, THE DUNAJEC RIVER

13.00 LUNCH

17.30 FOLLOWING THE TRACES OF EUROPEAN IDENTITY OF KRAKOW, MARKET SQUARE UNDERGROUND EXHIBITION

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Streszczenia referatów i posterów
Abstracts of papers

Ecology and Environmental Science
– Reduction of Water Stress and Adaptation to Aridity
Faculty of Environmental Engineering and Land Surveying
University of Agriculture in Krakow
Kraków, 9–10 June 2017

Wpływ nasłonecznienia legowisk w oborze na komfort termiczny bydła

Sabina Angrecka

Katedra Budownictwa Wiejskiego,
Uniwersytet Rolniczy im. Hugona Kołłątaja w Krakowie,
Al. Mickiewicza 24/28, 30-059 Kraków

Streszczenie: Celem badań było określenie wpływu nasłonecznienia na rozkład temperatury powierzchni legowisk w oborze kurtynowej. Pomiary poligonowe przeprowadzono na fermie bydła mlecznego w miejscowości Kobylany w oborze wolnostanowiskowej przeznaczonej dla 174 krów rasy Holstein-Friesian. Pomiarami stałymi objęto temperaturę i wilgotność względną powietrza oraz natężenie promieniowania słonecznego. Zasięg padania promieniowania słonecznego na powierzchni wybranych przyściennych boksów legowiskowych uzyskano w wyniku obserwacji, stałego systemu wizyjnego, pomiarów wykonanych kamerą termowizyjną oraz wartości kątów padania promieniowania słonecznego. Rozkład temperatury na powierzchni boksów legowiskowych mierzony był za pomocą kamery termowizyjnej. Przeprowadzone badania wykazały, że w lecie powierzchnia nasłonecznionych legowisk nagrzewa się do temperatury 40°C, a w skrajnych przypadkach nawet do 58°C, co stanowi zjawisko wyjątkowo negatywne dla zapewnienia dobrostanu krów. Największe obciążenie cieplne notowane było na legowiskach znajdujących się przy ścianie południowej, najmniejsze natomiast na legowiskach przy ścianie północnej, gdzie promienie słoneczne padały tylko w godzinach popołudniowych i wieczornych. Uwzględniony w przeprowadzonych badaniach wpływ zachmurzenia występującego w okresie obserwacji był znaczący na obniżanie temperatury powierzchni legowisk. W okresie upałów, krótkotrwałe, dziesięciominutowe zachmurzenie nieba powodowało spadek temperatury powierzchni legowisk o ok. 2,5°C. Przeprowadzona analiza zmiany usytuowania budynku względem stron świata okazała się niekorzystna dla nasłonecznienia legowisk. Spowodowała zwiększenie obszaru i czasu ich nasłonecznienia. Wykazane w badaniach zróżnicowanie nasłonecznienia legowisk pozwala optymalnie dobrać lokalizację poszczególnych grup technologicznych w oborze. Kro-

wy najbardziej wydajne powinny przebywać w części obory z legowiskami północnymi, a krowy przed zasuszeniem w części południowej. Rotacja taka ograniczy ryzyko wystąpienia stresu cieplnego u krów w szczycie laktacji.

Słowa kluczowe: obora, nasłonecznienie, legowiska, temperatura, bydło mleczne

Impact of the cubicles insolation on thermal welfare of cattle

Sabina Angrecka

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University of Agriculture in Krakow,
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Abstract: The aim of the study was to determine the impact of insolation on temperature distribution of the cubicles' area in a curtain barn. Polygon measurements were carried out in the village Kobylany in the free-stall barn designed for 174 cows of Holstein-Friesian breed. Regular measurements included air temperature, relative air humidity and intensity of solar radiation. The range of incidence of solar radiation on the surface of the selected cubicles was obtained from the observation, constant vision system, measurements made by infrared camera and from the angles of incidence of solar radiation. The temperature distribution on the surface of cubicles was measured by means of an infrared camera. The study we have conducted demonstrated that in the summer period, the area of insolated cubicles heated up to a temperature of 40°C, and in extreme cases up to 58°C, which should be regarded as an unusually negative phenomenon for the welfare of cows. The largest thermal load was noted in cubicles located at the southern wall, and the smallest, in cubicles at the northern wall, where the solar radiation fell only in the afternoon and evening hours. The impact of clouds occurring during observations, included in the studies, influenced the reduction of temperature in the area of the cubicles. During hot weather, short, ten-minute appearance of clouds, caused a decrease in the temperature of cubicles' surface by approx. 2.5°C. The analysis we have conducted has shown that the change in the building's orientation in relation to the point of compass proved to be detrimental to the insolation of cubicles. It resulted in an increase in the area and the duration of the insolation. Differentiation of cubicles' insolation, demonstrated in the studies, helps to optimally choose the location of various technological groups in the barn. The most productive cows should be kept in northern cubicles, and the cows before drying-off, in southern parts. Such rotation will reduce the risk of heat stress occurrence in cows at peak moment of lactation.

Keywords: barn, insolation, cubicles, temperature, dairy cattle

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Kraków, 9–10 June 2017

Zmienność użytkowania terenu i struktury przestrzennej jako wskaźnik oceny przekształceń środowiska

Katarzyna Cegielska

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Uniwersytet Rolniczy im. Hugona Kołłątaja w Krakowie,
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Streszczenie: Środowisko złożone jest z sieci łączących się elementów, które oddziałują na siebie wzajemnie. Dostarczenie bodźca zmieniającego jeden element powoduje zmianę pozostałych, w zależności od ich wielkości i wzajemnego rozmieszczenia. Przekształcenia środowiska o podłożu antropogenicznym rozumie się jako wymierny czynnik oddziaływania człowieka – siła (intensywność) oddziaływania systemu środowiska antropogenicznego na system środowiska przyrodniczego, pomiędzy którymi zachodzą złożone zależności.

Celem przeprowadzonych badań było przygotowanie repozytorium danych przestrzennych uzyskanych przy wykorzystaniu zróżnicowanych metod asocjacyjnych (interpretacja w zależności od przestrzeni rozważań wg normy ISO 19101). W ramach przeprowadzonych analiz obliczono szereg parametrów pokrycia terenu i sposobu jego zagospodarowania, pozwalających na określenie wielu czynników związanych z działalnością człowieka i sił naturalnych. Badania przeprowadzono w przyjętych polach podstawowej oceny, stanowiących regularną siatkę pól testowych. Umożliwiło to konfrontację rozkładów parametrów przestrzennych określanych w zależności od wybranego aspektu analizy. Jako materiał źródłowy wykorzystano dane dotyczące pokrycia terenu pozyskane z rządowej Bazy Danych Obiektów Topograficznych (skrót BDOT10k), dane przestrzenne dotyczące użytkowania ziemi i pokrycia terenu pozyskane z platformy Urban Atlas, ortofotomapy oraz dane statystyczne pozyskane z Banku Danych Lokalnych.

Dzięki zebranym i opracowanym materiałom przygotowano repozytorium wektorowych geodanych, obejmujących głównie obszar podmiejski miasta Krakowa. Dokonano szczegółowych analiz pokrycia terenu na tym obszarze. Efekty zrealizo-

wanych prac czekają na uzyskanie pozytywnych recenzji w celu opublikowania ich w czasopismach naukowych.

Słowa kluczowe: pokrycie i użytkowanie terenu, GIS, QGIS, geodane, analizy przestrzenne

Variation in land use and spatial structure as an indicator in environmental transformation assessment

KATARZYNA CEGIELSKA

Department of Spatial Planning and Landscape Architecture,
University of Agriculture in Krakow,
ul. Balicka 253C, 30-149 Krakow, Poland

Abstract: The environment is a network of interconnected and interdependent elements. A change in one element results in changes in other elements, depending on their size and relative positioning. Anthropogenic transformation of the environment is understood as a tangible factor of human influence – that is, the strength (intensity) of the impact of the anthropogenic environment on the natural environment, along with the complex reciprocal relationship between them.

The goal of the studies was to compile a repository of spatial data obtained using various association methods (interpretation depending on the universe of discourse in accordance with ISO 19101). The analyses resulted in the calculation of a number of land cover and land use parameters, which facilitated the determination of many factors related to anthropogenic and environmental phenomena. The study was carried out on identified basic fields of assessment that make up a regular grid of test plots. This facilitated confronting the distribution of spatial parameters, determined depending on the selected aspect of analysis. The source material was land cover data from the Database of Topographic Objects (BDOT10k), spatial data on land use and cover from the Urban Atlas platform, orthophotos, and statistical data from the Local Data Bank.

The material collected and developed in the project was used to compile a repository of vector geodata mainly for the suburban area of the city of Kraków. Land cover of the area was analysed in detail. The results of the studies are pending positive reviews in order to be published in scientific journals.

Keywords: land cover and use, GIS, QGIS, geodata, spatial analysis

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Wyznaczanie przepływu korytotwórczego

Wiktoria Czech

Katedra Inżynierii Wodnej i Geotechniki,
Uniwersytet Rolniczy im. Hugona Kołłątaja w Krakowie,
Al. Mickiewicza 24/28, 30-059 Kraków

Streszczenie: Celem pracy było wyznaczenie przepływu korytotwórczego Qdd w wybranych odcinkach rzecznych. Dla sześciu przekroi zlokalizowanych przy stacjach wodowskazowych na rzece Rabie wyznaczono przepływy charakterystyczne o określonym prawdopodobieństwie pojawienia się, z danych granulometrycznych uzyskano wielkość rumowiska, a za pomocą programu BAGS określono wartości wielkości transportu rumowiska unoszonego. Obliczono wartości przepływu korytotwórczego dla analizowanych przekroi. Uzyskane wyniki pozwoliły stwierdzić, że przepływ korytotwórczy nie ma jednej wartości, a zakres, w jakim należy go poszukiwać, mieści się w granicy Q50%–Q25%. Przepływ korytotwórczy jest przepływem deterministycznym, a nie teoretycznym, ponieważ jego wartość można określić za pomocą procedury obliczeniowej proponowanej przez wielu autorów. Przepływ ten powinien być rozważany jako jeden z ważniejszych przepływów obliczeniowych zarówno przy projektowaniu, jak i eksploatowaniu budowli hydrotechnicznych.

Słowa kluczowe: przepływ korytotwórczy, rzeka Raba

Determing the dominant channel-forming discharge

Wiktoria Czech

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Abstract: The studies attempted to determine the dominant (channel-forming) discharge Qdd and to find its value in selected river cross-sections. For the six cross sections in gauge stations of the Raba River, a series of t-year floods (characteristic discharge) was determined, particle size data made it possible to calculate the size of debris. Next, the BAGS software was used to determine the value of bed load transport. Thus, dominant discharge values for the analyzed river reaches and selected cross-sections were calculated. The results showed that the dominant discharge has no single value, but rather the range of values within the limit of Q50%–Q25%. Dominant discharge is a deterministic, not a theoretical flow, because its value can be determined by a computational procedure proposed by many authors. This flow should be considered as one of the major computational flows for the design and exploitation of hydraulic structures.

Keywords: dominant discharge, Raba River

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University of Agriculture in Krakow
Kraków, 9–10 June 2017

Analityczna struktura dla operatorów przesunięć ważonych na drzewach skierowanych

Piotr Dymek

Katedra Zastosowania Matematyki,
Uniwersytet Rolniczy im. Hugona Kołłątaja w Krakowie,
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Streszczenie: Teoria funkcji analitycznych odgrywa istotną rolę w teorii operatorów. Była źródłem nowych metod, przykładów, problemów oraz prowadziła do szeregu ważnych rezultatów. Na przykład badanie własności klasycznego operatora przesunięcia ważonego zawdzięcza wiele teorii przestrzeni Hardy'ego. To samo dotyczy operatorów Toeplitza, Hankela oraz operatorów kompozycji. Jeden z podstawowych obiektów w teorii operatorów, operator przesunięcia ważonego, był badany za pomocą funkcji analitycznych.

Podczas swoich badań starałem się zastosować metody teorii funkcji analitycznych do operatorów przesunięć ważonych na drzewach skierowanych. Klasa ta jest uogólnieniem klasycznych przesunięć ważonych. Została wprowadzona kilka lat temu i od tej pory stała się obiektem intensywnych badań. Już teraz jest źródłem wielu przykładów operatorów spełniających nieoczekiwane własności.

W trakcie badań m.in. wprowadziłem algebrę mnożników i na jej podstawie stworzyłem rachunek funkcyjny dla dowolnego operatora przesunięcia ważonego na drzewie skierowanym. Rachunek ten uogólnia klasyczny rachunek Dunforda-Riesza. Ponadto zbadałem własności ograniczonych punktów ewaluacji.

Głównym narzędziem badawczym był izomorfizm, pozwalający na dowolne zmienianie wag operatora przesunięcia ważonego na drzewie skierowanym (kosztem modyfikacji przestrzeni, w której działa operator, z klasycznej l^2 na ważoną typu l^2.

Słowa kluczowe: przesunięcia ważone na drzewie skierowanym, algebra mnożników, punkt ograniczonej ewaluacji

Analytic structure for weighted shift operators on directed trees

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Abstract: Theory of analytic functions plays a central role in the operator theory. It has been a source of new methods, examples and problems, and has led to numerous important results. The study of the unilateral shift owes much of its success to the use of the Hardy space theories. The same applies to the Toeplitz and Hankel operators or composition operators. Weighted shifts, one of the most basic objects in operator theory, have also been studied using the analytic function theory approach.

During my studies, I was trying to apply analytic function methods to the weighted shifts on directed trees. These operators form a class, which generalizes classical weighted shifts and is a source of interesting examples. This class was introduced several years ago, and it provided a lot of examples of operators with interesting properties.

During my research, I have introduced the algebra of multipliers, and on the basis thereof I have created a functional calculus for a given weighted shift operator on a directed tree. This calculus is a generalization of the classic Dunford-Riesz calculus. Moreover, I have investigated the properties of bounded point evaluations.

My main tool was an isomorphism, which allowed me to change weights of the given operator (the cost of such modification was a change of domain in which the operator acts, from the unweighted l^2 type to the weighted l^2 type).

Keywords: weighted shifts on directed trees, multiplication operator, bounded point evaluation

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Sezonowa zmienność zawartości i ładunków azotanów oraz fosforanów w potoku Smugawka w Beskidzie Wyspowym (Karpaty Zachodnie)

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Streszczenie: Celem pracy było ukazanie sezonowych zmian stężenia biogenów dostarczanych do potoku. Obliczono parametry fizjograficzne oraz hydrograficzne zlewni. Zmierzono parametry hydrometryczne, w tym średnią prędkość potoku. Ponadto zbadano rumowisko denne, określając wymiary poszczególnych ziaren. Pobrano próbki badawcze wody do oznaczeń zawartości azotanów i fosforanów oraz cech fizykochemicznych. Stężenia azotu amonowego i fosforanów przekroczyły wartości progowe przyjęte jako normy jakości wody w każdym badanym okresie. Temperatura wody była optymalna, podobnie jak wartość pH. Zlewnię zaklasyfikowano do potoków fliszowych karpackich (Dyrektywa 2000/60/WE chroniąca wodę przed zanieczyszczeniem u jej źródła).

Słowa kluczowe: biogeny, jakość wód powierzchniowych, obszar górski, sezonowość

Seasonal variability of nitrates and phosphates load in Smugawka mountain creek located in the Beskid Wyspowy range (western Carphatians)

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Abstract: The main objective of the study was to show the changes of phosphate, nitrate and ammonium nitrogen concentrations during the season. The physiographic and hydrographic parameters of the catchment area were calculated. Hydrometric parameters were measured, including the average discharge of the stream. In addition, bed load was investigated, based on the dimensions of the individual grains transported by fluvial deposition. Water samples were taken to determinate the content of biogens (nitrates and phosphates) as well as their physicochemical characteristics. Ammonium nitrogen and phosphate concentrations exceeded the threshold values adopted as water quality limit in each of the studied periods. The water temperature was optimal, as well as the pH value. The catchment area was classified as a mountainous flysch catchment according to the Water Framework Directive (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy).

Keywords: biogens, surface water quality, mountainous area, seasonality

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Badanie niepewności danych przestrzennych na przykładzie bazy ewidencji gruntów i budynków

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Streszczenie: Określenie niepewności danych przestrzennych zawartych w bazie ewidencji gruntów i budynków wykonano poprzez ocenę jakości tych danych na podstawie zaproponowanego modelu jakości danych przestrzennych. Badanie odniesiono do potrzeb i wymagań użytkowników bazy danych. Uzyskane wyniki pozwolą na określanie i porównanie jakości danych dotyczących różnych obiektów posiadających istniejące dane przestrzenne w bazie ewidencji gruntów i budynków. Cel naukowy badań zrealizowano poprzez przeprowadzenie analizy informacji zawartych w bazie ewidencji gruntów i budynków z terenu gminy Michałowice w województwie małopolskim. Uzyskane materiały poddane zostały analizie pod względem założonych elementów jakości danych, czyli: kompletności, spójności logicznej, dokładności położenia, dokładności czasowej oraz dokładności tematycznej. Dla tych elementów przyporządkowano odpowiednie wagi określone metodą hierarchicznego procesu analitycznego. Drugi etap badań polegał na przeprowadzeniu w wydziałach inwestycji i planowania urzędów gmin w powiecie krakowskim analizy preferencji elementów jakości danych z poziomu potrzeb użytkownika analizowanej bazy danych. Otrzymane wyniki tworzą macierz, która obliczona metodą AHP pozwala na uzyskanie wielkości wag dla pięciu elementów jakości danych reprezentujących preferencje użytkowników. Ostatni etap to obliczenie ważonych wartości punktowych oceny jakości danych oraz dwóch estymatorów: wartości średniej oraz współczynnika zmienności średnich.

Słowa kluczowe: niepewność danych przestrzennych, jakość danych przestrzennych

Study of spatial data uncertainty illustrated with an example of land and buildings register database

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Abstract: The uncertainty of spatial data included in land and building register database was determined on the basis of a proposed model of spatial data quality, by means of these data quality assessment. The research referred to the needs and requirements of database users. The results achieved in the research enabled the determination and comparison of data quality concerning different objects for which there are spatial data entries already existing in the land and building register database. The objective of the study was attained by means of analysing the pieces of information included in the land and building register database in the area of Michałowice municipality in the province of Małopolska. All research materials were analysed with regard to the assumed elements of data quality, i.e. its completeness, logical consistency, positional accuracy, temporal accuracy and thematic accuracy. The elements were assigned weights determined in the analytic hierarchy process (AHP). The second stage of the study focused on the examination of preferences of data quality elements with reference to analysed database users' needs, in Investment and Planning Departments of the municipalities in the Krakow area. The results form a matrix, which calculated in the AHP enabled the determination of weights for five data quality elements representing user preferences. The last stage entailed the calculation of weighted point values of the data quality assessment as well as the following estimators: mean value and coefficient of variation.

Keywords: spatial data uncertainty, spatial data quality

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Dynamika struktury zgrupowań biegaczowatych (*Coleoptera; Carabidae*) na terenach zalewowych rzek górskich

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Streszczenie: Górskie doliny rzeczne charakteryzują się dużą dynamiką procesów geomorfologicznych, a w konsekwencji znacznym zróżnicowaniem środowiskowym ekosystemów. Występowanie obszarów zalewowych, fluktuacja wartości przepływu brzegowego rzeki, a także mozaika roślinności w różnych stadiach sukcesji, wpływają na powstawanie unikalnych ekosystemów o olbrzymiej bioróżnorodności. Intensywna urbanizacja i przekształcenia linii brzegowej, szczególnie związane z regulowaniem koryt rzecznych prowadzą do degradacji całych dolin zalewowych oraz eliminacji wielu gatunków należących do ważnej grupy tzw. specjalistów środowiskowych. Wśród nich chrząszcze z rodziny biegaczowatych (*Coleoptera*, *Carabidae*) stanowią ważną grupę nadrzecznych drapieżników pełniących niezwykle ważną rolę w utrzymaniu łączności środowisk wodno-lądowych oraz stanowiących dobrą grupę bioindykatorów wykorzystywanych w badaniach oceny stanu środowiska. Celem pracy było określenie struktury zgrupowań biegaczowatych na terenach zalewowych rzek górskich, w gradiencie wysokości i odległości od lustra wody oraz wskazanie, w jaki sposób prace regulacyjne wpływają na strukturę zgrupowania tych organizmów. Badania prowadzono w 10 zróżnicowanych pod względem antropopresji przekrojach badawczych Czarnego Dunajca, w różnych odległościach od linii brzegowej: na otwartych, niezarośniętych łachach żwirowych, zaroślach przybrzeżnych oraz obszarach z późnosukcesyjną strukturą roślinną (głównie lasy nadrzeczne). Analizy statystyczne wskazały, iż odległość oraz wysokość od lustra wody są czynnikami silnie wpływającymi na zgrupowania nadrzecznych biegaczowatych. Wielkość ciała jest głównym parametrem struktury zgrupowań *Carabidae*, który silnie zależy od morfologii koryta. Na często zalew-

nych i niestabilnych łachach żwirowych występują gatunki o małych rozmiarach ciała i dużej sile dyspersji (*Bembidion sp.*), natomiast w miarę oddalania się od linii brzegowej średnia wielkość ciała biegaczowatych zwiększa się, co świadczy o większej stabilności warunków środowiskowych. W odcinkach uregulowanych w wyniku ustabilizowania dynamiki zalewania zanotowano zmniejszenie się liczebności, a nawet eliminację gatunków należących do ekologicznie ważnej grupy żwirowiskowych specjalistów środowiskowych, co skutkować może zerwaniem łączności ekologicznej środowisk wodno-lądowych oraz zaburzeniem w funkcjonowaniu całego ekosystemu. Wyniki wskazują, iż zachowanie odcinków rzek o naturalnej dynamice zalewania pozwala na utrzymanie wysokiej różnorodności biologicznej w strefie nadrzecznej, co wpływa na prawidłowe funkcjonowanie ekosystemów wodno-lądowych.

Słowa kluczowe: biegaczowate, siedliska nadrzeczne, zalewanie, łachy żwirowe, różnorodność gatunkowa, wielkość ciała

Dynamics of the ground beetle (*Coleoptera; Carabidae*) assemblages structure in the flooded riparian areas

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Abstract: Mountain floodplains are characterized by a high dynamics of geomorphological processes and, consequently, high diversity of riparian ecosystems. The occurrence of differently flooded benches, open gravel bars, bankfull flow values, and mosaic of vegetation at different stages of succession, create a unique and diverse habitats where only well adapted species can occur. The intensive urbanization and river channel regulations leads to the degradation of entire floodplains and in effect the elimination of many species belonging to the exposed riverine sediment specialists. Among organisms inhabiting exposed riverine sediments and generally riparian zone, ground beetles (*Coleoptera*; *Carabidae*) have been particularly successful in colonizing these unstable habitats and being a useful bioindicator in such environmental studies. As riverbank predators feeding on aquatic invertebrates, they are an important element of riparian ecosystems, strongly dependent on the aquatic–terrestrial subsidies along river corridors. The aim of the study was to analyse the composition and the structure of riparian carabid assemblages in

relation to environmental parameters (e.g. elevation, distance to the water level, availability and size of the gravel bar patches, riparian vegetation), and to estimate the influence of river channel regulations on ground beetles' diversity and species richness. The research was conducted in 10 cross-sections on the Czarny Dunajec River. Cross-sections were located in the regulated sections and unmodified ones, in varying distance to the water level: unvegetated open gravel bars, periodically flooded shrubs and riparian forest. Statistical analyses showed that the elevation and distance to the water level are the strongest factors influencing the carabid assemblages structure and diversity. The body size was the main parameter, which shaped species distribution on the riverbanks and strongly depended on channel morphology and the presence of benches. Frequently and dynamically inundated gravel bar patches are marked by high abundance of the smallest body size and high dispersal power of carabid species (*Bembidion sp.*). On the other hand, the medium and large species are representative for the rarely flooded or not flooded riparian shrubs and forest. Moreover the riverbank regulation impacts the composition and structure of carabid beetles assemblage and it poses a threat for the smallest exposed riverine sediment specialist species. This can result in the disruption of the connection between aquatic and terrestrial environments, and finally the disturbance in the functioning of the whole ecosystem. The results showed that maintenance of natural inundated river sections may lead to conservation of high riparian biological diversity, which is very important, particularly for the proper functioning of the aquatic-terrestrial ecosystems.

Keywords: carabid beetles, riparian habitats, flood, gravel bars, species diversity, body size

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Zmienność i tendencje zmian warunków termicznych na obszarze Polski

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Streszczenie: Celem badań była charakterystyka zmienności i tendencji zmian warunków termicznych na obszarze Polski w latach 1971–2010, a więc w okresie obejmującym starą (1971–2000) i obowiązującą (1981–2010) normę klimatyczną. Zasadniczym celem było ukazanie różnic i zmian pomiędzy wskazanymi normami, a także ekologicznych i gospodarczych skutków tych zmian. W opracowaniu wykorzystano średnie miesięczne wartości temperatury powietrza z 53 stacji meteorologicznych rozmieszczonych równomiernie na obszarze Polski z okresu 1971–2010.

Na podstawie uzyskanych wyników ukazano zróżnicowanie przestrzenne temperatury powietrza na obszarze Polski w poszczególnych klimatycznych porach roku w nowej, obowiązującej normie klimatycznej 1981–2010 w porównaniu z poprzednio obowiązującą normą 1971–2000. Wykazano również zróżnicowanie przestrzenne czasu trwania termicznych pór roku, obejmujących okres wegetacyjny, na obszarze Polski w porównywanych wieloleciach 1981–2010 i 1971–2000. Na podstawie porównania średnich długości termicznych pór roku w okresach 1971–2000 i 1981–2010 wykazano wydłużenie meteorologicznego okresu wegetacyjnego o 4 dni. Zmiany te są wynikiem wzrostu średniej temperatury, szczególnie w ciepłym półroczu.

Słowa kluczowe: temperatura, zmiany klimatu, Polska

Variability and trends in the changes of thermal conditions in Poland

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Abstract: The research objective was to describe the variability and trends in the changes of thermal conditions in Poland between 1971 and 2010, i. e. in the period covering the previous climate normal (1971–2000) and the one currently in force (1981–2010). The basic aim was to present the differences and changes between the above mentioned normals, as well as the ecological and economic results of these changes. The paper uses average monthly values of air temperature from 53 meteorological stations, evenly distributed in Poland, from the 1971–2010 period.

On the basis of the results obtained, spatial diversity of air temperature in Poland was shown in particular climatic seasons of the year in the new official climate normal 1981–2010 as compared with the previous 1971–2000 normal. Also the spatial diversity was shown of the duration of thermal seasons covering the vegetation period in Poland in both periods under comparison, 1981–2010 and 1971–2000. The comparison of the average durations of thermal seasons of the year in the periods 1971–2000 and 1981–2010 showed the lengthening of the meteorological vegetation period by 4 days. Those changes are the result of the increase in average temperature, especially in the hot half-year.

Keywords: temperature, climate change, Poland

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Wiarygodność wyznaczenia pozycji oraz powierzchni z wykorzystaniem systemu GNSS

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Streszczenie: Badania skupiły się na ocenie dokładności i precyzji wyznaczania pozycji oraz powierzchni z wykorzystaniem globalnych systemów satelitarnych dla potrzeb badań przyrodniczych. Cel osiągnięto poprzez określenie stopnia powtarzalności wyników pomiarów jednoczęstotliwościowymi oraz dwuczęstotliwościowymi odbiornikami satelitarnymi. Ewaluacji poddano poprawność implementacji tych informacji w badaniach przyrodniczych i środowiskowych, ze szczególnym uwzględnieniem eksperymentów wieloletnich. Powtarzalność wyznaczania pozycji wpływa na wnioskowanie w toku opracowywania badań przyrodniczych i środowiskowych, a niedokładne pozycjonowanie może zaburzać poprawność eksperymentów wieloletnich. Przeprowadzono szereg sesji pomiarowych, w wyniku których zgromadzono zbiory danych opisujących zmiany współrzędnych w trakcie doby dla metody kodowej (pomiar pseudoodległości) i metody RTN (*real-time network*). Pozyskane dane posłużyły także do określenia dokładności i powtarzalności wyznaczenia powierzchni z użyciem jednoczęstotliwościowych odbiorników kodowych.

Częściowe wyniki badań zaprezentowano na konferencjach o charakterze krajowym i międzynarodowym, na których propagowano wiedzę na temat dokładności i stopnia wiarygodności wyznaczenia pozycji oraz powierzchni dla potrzeb badań przyrodniczych. Wskazano na dobre praktyki związane z wyznaczaniem pozycji i wartości powierzchni na podstawie pomiaru pseudoodległości do satelitów systemu GPS. Wartość możliwych błędów średnich oraz ich wpływ na pomiary w ujęciu dobowym zostały wyznaczone.

Słowa kluczowe: pozycja, pseudoodległość, RTN, powtarzalność

Precision of positioning and surface area determination using the GNSS

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Abstract: Research has focused on the evaluation of the accuracy and precision of positioning and surface area determination using the Global Navigation Satellite System (GNSS), for the purpose of research in the field of natural sciences. The objective of this research project was achieved by determining the degree of repeatability of measurement results obtained by using the single-frequency and two-frequency satellite receivers. The correctness of the implementation of positioning information in natural and environmental research projects was evaluated, with special attention to multi-year experiments. Repeatability of positioning affects the inference and line of reasoning in the development of research results in natural sciences and environmental field. Inaccurate positioning can affect the validity of multi-year experiments. The series of measurement sessions were conducted. As a result, data sets were collated, describing coordinates' change during the daily measurements performed using the code method (pseudorange measurement) as well as the real-time network method (RTN). The data were also used to determine the accuracy and repeatability of surface area values, obtained using single-frequency code GPS receivers.

Partial research results were presented at national and international conferences, where knowledge on the accuracy and reliability of the positioning and surface area determination for natural sciences research was promoted. Good practices were indicated, related to the positioning and surface area determination based on pseudorange measurements to Global Positioning System (GPS) satellites. The values of possible mean errors and their impact on daily measurements were determined.

Keywords: position, pseudorange, RTN, repeatability

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Weryfikacja wybranych wzorów empirycznych do szacowania kwantyli przepływów maksymalnych rocznych o określonym prawdopodobieństwie przewyższenia w zlewniach dorzecza górnej Wisły

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Streszczenie: Badania zrealizowano dla dziewięciu wybranych zlewni regionu wodnego Górnej Wisły. Dane do obliczeń, w postaci serii obserwacyjnej przepływów maksymalnych rocznych, pozyskano z Instytutu Meteorologii i Gospodarki Wodnej PIB w Warszawie, i obejmowały wielolecie 1971–2015. Otrzymane dane zostały poddane weryfikacji statystycznej na jednorodność, istotność trendu monotonicznego, elementy odstające oraz równość wariancji. Przepływy maksymalne o zadanym czasie powtarzalności zostały oszacowane za pomocą metody statystycznej – rozkładu Pearsona typ III oraz wzorów empirycznych: obszarowego równania regresji i wzoru Punzeta. Weryfikacji wzorów empirycznych dokonano poprzez wyznaczenie błędów względnych pomiędzy wartościami przepływów maksymalnych prawdopodobnych o określonym prawdopodobieństwie przewyższenia, uzyskanych za pomocą metody statystycznej oraz wzorów empirycznych. Uzyskane wyniki badań wskazują na znaczne dysproporcje pomiędzy wartościami otrzymanymi z metody statystycznej oraz analizowanych wzorów empirycznych. Dla obszarowego równania regresji średnia wartość błędu względnego to 93%, a dla wzoru Punzeta – 73%. Zatem należy podjąć dalsze działania związane z weryfikacją oraz uaktualnieniem wzorów empirycznych do szacowania kwantyli przepływów maksymalnych.

Słowa kluczowe: przepływy maksymalne prawdopodobne, wzory empiryczne, weryfikacja

Verification of selected empirical formulas to calculate flood frequency in selected catchments of upper Vistula basin

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Abstract: The study was implemented for nine selected catchments of upper Vistula basin. The data for the calculations, in the form of observational time series of the maximum annual flows for the period 1971–2015, was obtained from the National Institute of Meteorology and Water Management (NIR) in Warsaw. Obtained data was subjected to statistical verification for homogeneity, significance of trend, outliers and homogeneity of variance. The flood frequency was calculated using statistical method of Pearson III distribution as well as empirical formulas of spatial equation regression and Punzet formula. Verification of empirical formulas was conducted by the calculation of relative errors between the values of flood frequency obtained from statistical method, and those obtained with empirical formulas. Based on the obtained results, it was concluded that there were significant differences between the obtained values. For spatial equation regression, mean relative error was 93%, and for Punzet formula, this value equaled 73%. Hence it is necessary to take action in order to verify and update the empirical formulas for calculating flood frequency.

Keywords: flood frequency, empirical formulas, verification

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Waloryzacja hydromorfologiczno-krajobrazowa wybranych dolin rzecznych

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Streszczenie: Doliny rzeczne dzięki swojej przyrodniczej odmienności wyraźnie wyróżniają się w krajobrazie terenów otwartych. Zmiany zachodzące na ich obszarze, nawet te, które dotyczą samego koryta cieku, mają wpływ na strukturę całego krajobrazu. Waloryzacja hydromorfologiczno-krajobrazowa, zgodnie z LandScape & HydroMorphological Assesment of River Valleys Method (LSHM Method), została wykonana w dwóch dolinach rzecznych: w dolinie Białki i Czarnego Dunajca. Celem badawczym była weryfikacja powstałej metody hydromorfologiczno-krajobrazowej dolin rzecznych LSHM Method. Przeprowadzenie oceny pozwoliło na stwierdzenie, czy powstała metoda wymaga modyfikacji.

Słowa kluczowe: górskie doliny rzeczne, ocena hydromorfologiczna, ocena krajobrazowa, metoda LSHM

Hydromorphological and landscape valorisation of selected river valleys

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Abstract: River valleys, thanks to their natural distinctness, stand out clearly in the open landscape. Changes occurring in the river valley, even those relating to the river channel, affect the structure of the entire landscape. Hydromorphological and landscape assessment, according to the LandScape & HydroMorphological Assesment of the River Valleys Method (LSHM Method), was conducted in two river valleys, in the Białka River Valley and Czarny Dunajec River Valley. The goal of this research was to verify the hydromorphological and landscape method of the river valley, the LSHM Method. Conducted assessment allowed us to determine whether the LSHM Method requires any modifications.

Keywords: mountain river valleys, hydromorphological assessment, landscape evaluation, LSHM Method

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Zmiany zachodzące w strukturze użytkowania gruntów

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Streszczenie: W pracy dokonano oceny możliwości zastosowania metod statystycznych do analizy zmian zachodzących w użytkowaniu gruntów i wykrywania trendów występujących w tym użytkowaniu. W tym celu dokonano analizy zmian zachodzących w strukturze użytkowania gruntów województwa małopolskiego w latach 2002–2015. Wykorzystano cztery zmienne: powierzchnia użytków rolnych, powierzchnia gruntów leśnych, powierzchnia gruntów zabudowanych i zurbanizowanych oraz powierzchnia nieużytków. Jako metodę badań przyjęto test Manna-Kendalla na istnienie trendu monotonicznego. Wyniki wskazały na istnienie malejącego trendu w powierzchni użytków rolnych oraz rosnącego trendu w przypadku pozostałych zmiennych. Udało się zatem wykazać, iż wybrane metody statystyczne mogą być wykorzystywane do analizy zmian zachodzących w użytkowaniu gruntów.

Słowa kluczowe: użytkowanie gruntów, metody statystyczne, analiza trendu, Polska

Changes in land use structure

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Abstract: The paper looked into the possible applications of statistical methods for analysing the changes in land use and for the identification of land use trends. To this end, changes in the structure of land use in the Małopolskie Voivodeship (Poland) in 2002–2015 were analysed. Four variables were used: surface area of agricultural lands, surface area of forest lands, surface area of built-up and urbanised lands, and surface area of wasteland. The study method was Mann-Kendall test for monotonic trend. The results suggested a negative trend for agricultural land surface area and a positive trend for the other variables. It was demonstrated that the selected statistical methods can be used for analyzing the changes in land use.

Keywords: land use, statistical methods, trend analysis, Poland

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Transport rumowiska rzecznego w korycie cieku z korekcją stopniową w postaci bystrzy o zwiększonej szorstkości symulowany za pomocą modeli numerycznych

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Streszczenie: Celem badań było wykazanie, że klasyczne metody obliczania wielkości wleczonego materiału rzecznego mogą być z powodzeniem zastąpione przez metody numeryczne, jakie są stosowane w modelu CCHE2D i w programie komputerowym BAGS. W celu uzyskania zamierzonych w pracy efektów, jakimi będą ocena skuteczności działania modelu CCHE2D i programu komputerowego BAGS, zostały wykonane prace terenowe, symulacyjne i studialne. Pomiary terenowe składały się z pomiarów geodezyjnych, hydrodynamicznych oraz z granulometrycznych. Pomiary geodezyjne koryta cieku zostały wykonane przed oraz po przejściu fali wezbraniowej. Pozwoliły one na pokazanie zmian w układzie dna w odcinku koryta cieku, gdzie znajduje się bystrze o zwiększonej szorstkości. Również pomiary granulometryczne pozwoliły na wykazanie zmian w granulometrii i morfologii koryta cieku po przejściu fali wezbraniowej. Z kolei dzięki pomiarom hydrodynamicznym zostały uzyskane takie parametry, jak: napełnienie, prędkość średnia i chwilowa, naprężenie styczne oraz liczba Froude'a. Dzięki pomiarom geodezyjnym została utworzona siatka modelowa. Ponadto dane hydrodynamiczne i granulometryczne posłużyły do kalibracji modelu. Poprawność wyników symulacji transportu rumowiska wleczonego uzyskanych za pomocą modelu CCHE2D i programu BAGS została sprawdzona przy użyciu klasycznych metod określania wielkości i intensywności transportu materiału rzecznego. Wykazano, iż model CCHE2D nie może być stosowany do symulacji transportu rumowiska wleczonego i prognozy zmian morfologicznych w dnie rzecznym w korytach uregulowanych za pomocą bystrzy o zwiększonej szorstkości.

Słowa kluczowe: transport rumowiska wleczonego, modelowanie numeryczne, CCHE2D, BAGS

Bed-load transport simulation in river channel close to block ramp with using numerical models

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Abstract: The aim of the study was to answer the question whether the classical methods of calculating the intensity of bed-load transport can be successfully verified by the numerical methods, such as CCHE2D model and BAGS software. For the purposes of the study, which was to evaluate the effectiveness of the CCHE2D model and BAGS software, field studies were conducted as well as, simulation modeling and their analysis. Field measurements performed included: land survey, hydrodynamic measurements and granulometric measurements and analysis. Land surveys of the river channel were performed before and after the flood. They made it possible to observe the changes in the riverbed near the selected block ramp. Granulometric measurements also demonstrated the changes in pebbles size distribution and channel morphology after the flood. Hydrodynamic measurements were performed to obtain the following parameters: water depth, local, average and maximum water velocities, shear stress and Froude number. The data from the land surveys was used to create a model grid for the CCHE2D. Hydrodynamic and granulometric data was used to calibrate the model. The BAGS model was used as an additional measure, to obtain bed-load transport results. The main conclusion of the study is that the CCHE2D model cannot be used to simulate the bed-load transport or to predict the morphological riverbed changes in a revier channel regulated with block ramps.

Keywords: bed-load transport, numerical modeling, CCHE2D model, BAGS software

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Przetwarzanie danych przestrzennych w celu oceny ładu przestrzennego

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Streszczenie: Budowanie stanu ładu przestrzennego stoi wysoko nie tylko w hierarchii zadań własnych gminy, lecz także zgodnie z Koncepcją Przestrzennego Zagospodarowania Kraju 2030 jest jednym z sześciu celów krajowej polityki przestrzennej. Mimo powyższych uwarunkowań, nadal brakuje uniwersalnych i kompleksowych metod badania stanu ładu przestrzennego, które zapewniłyby szybką i wiarygodną ocenę przestrzeni w tym aspekcie. Szczególnie trudnym elementem kreowania stanu ładu przestrzennego jest zachowanie ładu przyrodniczego, który powinien stanowić bazę dla wszelkich działań w ramach budowania zrównoważonego rozwoju.

W pracy dokonano oceny stanu ładu przestrzennego w jego aspekcie przyrodniczym. Przyjęto, że zróżnicowanie stanu ładu przestrzennego w jego aspekcie przyrodniczym jest oparte na relacji pomiędzy występowaniem w terenie obszarów naturalnych oraz antropogenicznych. Badania przeprowadzono w strefie podmiejskiej Krakowa. Obszarem objętym analizą jest gmina Zielonki, wykazująca najszybszy wzrost wartości gęstości zaludnienia wśród gmin Krakowskiego Obszaru Metropolitalnego. Obszar gminy podlega silnym przemianom związanym ze zjawiskiem suburbanizacji. Jednocześnie niemal w całości badana gmina położona jest w zakresie występowania obszarów cennych przyrodniczo, takich jak: otulina Ojcowskiego Parku Narodowego oraz obszary parków krajobrazowych i ich otulin – Parku Krajobrazowego Dolinki Krakowskie i Dłubniańskiego Parku Krajobrazowego.

Oceny stanu ładu przestrzennego w jego aspekcie przyrodniczym dokonano przy użyciu metody bonitacji punktowej. Dla realizacji celu obszar badawczy zo-

stał podzielony na heksagony o powierzchni 1 km^2. Przestrzenna skala badania obejmuje 77 heksagonów. W badaniach wykorzystano dane z zasobu Bazy Danych Obiektów Topograficznych BDOT10k. Zaproponowane w pracy mierniki pozwalają na wykonywanie oceny stanu ładu przyrodniczego badanego obszaru w sposób cykliczny, z częstotliwością dostosowaną do częstotliwości aktualizacji bazy danych BDOT10k. Ponadto zaproponowaną metodę cechuje wysoki stopień uniwersalności, możliwe jest jej wykorzystanie na innych obszarach badawczych.

Słowa kluczowe: ład przestrzenny, obszary cenne przyrodniczo, GIS

Spatial data processing in the protection of spatial order

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Abstract: Striving for spatial order is not only an important priority among the statutory tasks of municipalities, but also one of the six goals of the spatial policy of Poland according to the National Spatial Development Concept 2030. Despite the above-mentioned incentives, there are still no universal and comprehensive methods for investigating the state of spatial order that would facilitate a quick and reliable assessment of space in this regard. Preservation of environmental order, which should be the foundation of all activities in the effort to build sustainable development, is a particularly difficult element in the pursuit of spatial order.

The paper assesses spatial order as regards the natural environment. It was assumed that the diversification of environmental spatial order is based on the relationship between natural and anthropogenic zones in an area. The study was conducted in the suburbs of Kraków. The analysed area was the Zielonki Municipality, which has the highest population density index growth from among all municipalities in the Kraków Metropolitan Area. The Municipality undergoes profound transformations related to suburbanisation. Virtually the whole Municipality is located in valuable natural areas such as the buffer of the Ojców National Park and landscape parks with their buffers: the Kraków Valleys Landscape Park and the Dłubnia Landscape Park.

The assessment of spatial order as regards the natural environment was carried out using the point bonitation method. The investigated area was divided into

1 km^2 hexagons. The study encompassed 77 such hexagons. It was based on the data from the Database of Topographic Objects, BDOT10k. The proposed parameters facilitate periodic assessment of environmental governance in the area, depending on the frequency of updating the BDOT10k database. The suggested method is highly universal: it may be applied to other research domains.

Keywords: spatial governance, valuable natural areas, GIS

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Warunki termiczne posadzki w oborze wolnostanowiskowej z głęboką ściółką

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Streszczenie: W pracy przedstawiono wyniki badań wybranych parametrów mikroklimatu wewnętrznego oraz temperatury podłoża ściółkowego w oborze wolnostanowiskowej z utrzymaniem zwierząt na głębokiej ściółce. Badania wykonano w okresie od 22 marca 2014 r. do 22 marca 2015 r. Analiza kształtowania się temperatury powierzchni ściółki wykazała silny związek z temperaturą powietrza wewnątrz budynku. W okresie letnim stwierdzono okresowe przekroczenia dopuszczalnej temperatury powietrza wewnętrznego, nawet o 12°C. Badania wykazały istotny wpływ obsady na temperaturę powierzchni ściółki. Okresy, w których zwierzęta przebywały w budynku pozwoliły na wyodrębnienie dwóch stref: przyściennej, o szerokości ok. 1,5 m od zachodniej ściany zewnętrznej budynku oraz środkowej w pozostałej części hali produkcyjnej. Różnice temperatury ściółki pomiędzy wymienionymi strefami w czasie przebywania krów w oborze sięgały 10°C. W czasie, gdy budynek pozostawał pusty, a zwierzęta przebywały na pastwisku, zróżnicowanie temperatury powierzchni ściółki było zdecydowanie mniejsze i nie przekraczało 3°C.

Słowa kluczowe: obora, głęboka ściółka, temperatura ściółki

The thermal conditions of the floor in a free-standing deep-litter barn

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Abstract: The paper presents results of studies of some indoor microclimate parameters and temperature of litter bedding in a freestall barn used to house dairy cattle in a deep-litter bedding system. The studies were conducted in the period from 22 March 2014 to 22 March 2015. The analysis of the distribution of litter surface temperature showed its strong correlation with indoor air temperature. In summer, temporary exceedances were noted of the allowable indoor air temperature by as much as 12°C. The studies showed a significant effect of the number of animals in the barn on the litter surface temperature. In the periods when cows stayed in the barn, two zones could be distinguished: the sidewall zone, 1.5 m wide, at the western outside wall of the building, and the inner zone, encompassing the remaining part of the barn. Differences in litter temperature between these zones, when cows stayed in the barn, reached 10°C. When the building was empty and animals were out on pasture, the differences between litter surface temperatures were much smaller and did not exceed 3°C.

Keywords: barn, deep-litter bedding, litter temperature

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Prognoza obrukowania dna oraz określenie warunków początku ruchu rumowiska dennego na rzece Biała

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Streszczenie: W ramach realizacji tematu wykonano pomiary granulometryczne rumowiska tworzącego pokrywę denną oraz pomiary geodezyjne (niwelację poprzeczną oraz podłużną) na wybranych odcinkach rzeki Biała. Pomiary te były bazą do wykonania oceny hydrodynamicznej oraz określenia warunków intensywności transportu rumowiska tworzącego pokrywę denną. Na podstawie przeprowadzonych badań i analiz dokonano oceny wielkości transportu rumowiska wleczonego za pomocą programu TRANS na wybranych odcinkach dla wybranych przepływów charakterystycznych oraz dla wezbrania, które wystąpiło na analizowanym terenie w trakcie prowadzenia prac. Przeprowadzona prognoza obrukowania dna na wybranych odcinkach umożliwiła określenie przepływu zrywającego obrukowanie, po przekroczeniu którego w korycie występuje transport masowy wszystkich frakcji rumowiska dennego.

Słowa kluczowe: transport rumowiska, obrukowanie dna, Biała

Forecasting of armouring procesess and assesment of bed-load transport conditions on the Biała River

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Abstract: As part of the research project implementation, granulometric measurements of the materials forming the river bed and geodetic measurements (cross-sections and longitudinal levelling) were carried out on selected sections of Biała River. These measurements were the basis for the evaluation of hydrodynamic balance, and for the determination of transport conditions of the bed-load. Based on the studies and analyses performed, the transport of sediment was calculated by using the TRANS software on the particular sections, for selected characteristic flows and for the flood that occurred within the analysed area during the study. The armouring process forecasts on the selected sections were calculated, making it possible to determine the water level at which the armoured layer breaks and causes mass transport of all fractions in the riverbed.

Keywords: bedload transport, armoured riverbed, Biała River

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Wykorzystanie wybranych metod taksonomicznych do oceny uwarunkowań rozwoju

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Streszczenie: Tematem badań było wykorzystanie metod taksonomii numerycznej do oceny uwarunkowań rozwoju wybranych jednostek terytorialnych. W wyniku przeprowadzonych badań wskazano obszary problemowe oraz jednostki charakteryzujące się najlepszymi warunkami rozwoju, biorąc pod uwagę rozwój społeczny, gospodarczy i środowiskowy. Dodatkowo, w toku analiz, oceniono możliwości wykorzystania różnych procedur taksonomicznych do badania uwarunkowań rozwoju jednostek terytorialnych, a także wskazano możliwości wykorzystania tych metod w innych opracowaniach przestrzennych. W ramach projektu przeprowadzono dwie analizy. Jedna z nich dotyczyła oceny potencjału rozwojowego wybranych gmin za pomocą metody typologii. Procedura ta pozwoliła na zbadanie zróżnicowania przestrzennego parametrów przyjętych do analizy i wskazanie obszarów o największym potencjale rozwoju. W badaniach wykorzystano wskaźniki opisujące uwarunkowania społeczne, gospodarcze i środowiskowe na wybranych obszarach, udostępniane przez Główny Urząd Statystyczny. Pozwoliło to na wskazanie problemów, na których powinny skupić się działania władz tych gmin w celu poprawy niekorzystnej sytuacji. Podkreślono także konieczność prowadzenia monitoringu i podejmowania działań interdyscyplinarnych. Środki finansowe otrzymane w ramach niniejszego projektu pozwoliły również na przeprowadzenie badania rozwoju zrównoważonego powiatów województwa śląskiego z wykorzystaniem metody ścieżki rozwoju Hellwiga, która należy do taksonomicznych metod porządkowania liniowego. Do badania wykorzystano wskaźniki opisujące zarówno ład społeczny, gospodarczy, środowiskowy, jak i instytucjonalno-polityczny, udostępniane za pomocą aplikacji Wskaźniki Zrównoważonego Rozwoju. Efekty re-

alizowanych badań zostały przedstawione na konferencjach naukowych, zarówno krajowych, jak i zagranicznych. Przeprowadzone analizy opisane zostały również w publikacjach, które są obecnie recenzowane. Najważniejszym osiągnięciem przeprowadzonych badań było pokazanie możliwości zastosowania metod taksonomii numerycznej do badań przestrzennych. Procedury te mogą być wykorzystywane jako narzędzia służące monitorowaniu rozwoju jednostek podstawowego podziału terytorialnego kraju, a co za tym idzie – mogą być pomocne w podejmowaniu decyzji, a także sporządzaniu różnego rodzaju opracowań planistycznych oraz strategii i programów rozwoju.

Słowa kluczowe: taksonomia numeryczna, rozwój zrównoważony, potencjał rozwojowy, typologia, metoda Hellwiga

Application of selected taxonomic methods to assess development conditions

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Abstract: The research focused on the application of numerical taxonomy to assess development conditions of selected territorial units. It resulted in identifying problem areas and units with the best development conditions in terms of social, economic, and environmental development. Additionally, performed analyses assessed the possibility of using various taxonomic procedures to investigate development conditions of territorial units, and indicated the possibilities of employing these methods in other space-related studies. The project included two analyses. One of them assessed the development potential of selected municipalities using the typology method. This procedure facilitated insight into spatial differentiation of the analysed parameters and led to the identification of areas with the greatest development potential. The study involved indicators describing social, economic, and environmental conditions in selected areas as made available by the Central Statistical Office. This helped determine the issues on which the authorities in charge of the municipalities should focus in order to improve the situation. The necessity for the monitoring and taking interdisciplinary actions was stressed as well. Project funding also allowed the research team to look into the sustainable development of districts of the Silesian Province (Po-

land) using the Hellwig development path method, which is a taxonomic method of linear ordering. The study involved indicators for social, economic, environmental as well as institutional and political order made available in the Sustainable Development Indicators application. Results of the studies were presented during academic conferences, both in Poland and abroad. The analyses were also described in publications, currently pending review. The greatest achievement of the studies was to demonstrate the possibility of applying numerical taxonomic methods to spatial studies. These procedures may be used as tools for monitoring the development of units of basic territorial subdivision of a country, and thus facilitate decision-making and preparation of various planning documents and development strategies and programmes.

Keywords: numerical taxonomy, sustainable development, development potential, typology, Hellwig method

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Rodzaje i sposoby kształtowania zieleni na terenach poprzemysłowych (w ramach procesu rewitalizacji)

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Streszczenie: Proces rewitalizacji odbywa się na różnych płaszczyznach i skutkuje zmianami funkcji terenów, układu urbanistycznego oraz wyrazu architektonicznego, użytkowników przestrzeni, infrastruktury, zmian w polityce samorządowej. Jednak interwencje związane z wprowadzaniem zmian w krajobrazie miasta poprzez np. projektowanie systemów terenów zieleni są jednym z priorytetowych czynników.

Głównym celem badań było podanie najefektywniejszych metod na właściwe zagospodarowanie terenów poprzemysłowych w ramach procesu rewitalizacji, zbadanie roli zieleni w tych procesach oraz możliwości ich wykorzystania w planowaniu przestrzennym dla zrównoważonego rozwoju obszarów zurbanizowanych. Ważnym elementem było także określenie znaczenia zieleni w kreowaniu tożsamości miejsca oraz kształtowaniu ładu przestrzennego i poprawy warunków ekologicznych. W ramach prac badawczych przeprowadzono badania *in situ*, inwentaryzację oraz sporządzono dokumentację fotograficzną na obszarze terenów poprzemysłowych Zagłębia Ruhry i okolic Lipska w Niemczech oraz na terenie Górnośląskiego Okręgu Przemysłowego. Wyniki badań zostały zaprezentowane na konferencji PROREVITA w Łodzi Rewitalizacja miast w kierunku integracji procesów, mechanizmów i metod działania, która odbyła się 27–28 października 2016 r. (*Sposoby oraz możliwości kształtowania zieleni na terenach poprzemysłowych* oraz współautorstwo: *Genius loci w koncepcji lokalnego programu rewitalizacji miasta Dobczyce*), a także na konferencji 2nd International Scientific Conference, Dilemmas and challenges of land management, Uniwersytet Rolniczy w Krakowie (*Zieleń w procesach rewitalizacji terenów poprzemysłowych na obszarze Zagłębia Ruhry i Górnośląskiego Okręgu Przemysłowego*).

Słowa kluczowe: rewitalizacja, parki, zieleń na terenach poindustrialnych

Types and methods of shaping greenery in former industrial sites (as part of revitalization)

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Abstract: Regeneration involves multiple domains and results in changes to the function of the area concerned, the urban layout and architectural expression, the users of the space, the infrastructure, and the local government policy. Interventions involving changes in the urban landscape may be effected through the design of a system of green areas as a priority factor.

The primary goal of the present study was to determine the most effective methods of appropriate redevelopment of former industrial sites under regeneration and to gain insight into the role of greenery in these processes as well as the potential use thereof in spatial planning to ensure sustainable development of urban areas. Determination of the importance of greenery in creating the identity of a location, in shaping spatial order, and improving ecological conditions was another important focal point. The research involved field tests, a survey, and preparation of a photo report regarding former industrial sites in the Ruhr district and near Leipzig in Germany and in the Upper Silesian Industrial Region. Results of the studies were presented during the PROREVITA conference in Łódź: City revitalisation – toward integration of processes, mechanics and methods of processing 27–28.10.2016 (*Methods and Possibilities of Shaping Greenery in Former Industrial Sites* and joint speech: *Genius loci in the Local Redevelopment Programme for Dobczyce*) and during the 2nd Scientific Conference, Dilemmas and Challenges of Land Management, University of Agriculture in Krakow (*Greenery in Regeneration of Former Industrial Sites in the Ruhr and in the Upper Silesian Industrial Region*).

Keywords: revitalization, parks, greenery in former industrial sites

Ecology and Environmental Science
– Reduction of Water Stress and Adaptation to Aridity
Faculty of Environmental Engineering and Land Surveying
University of Agriculture in Krakow
Kraków, 9–10 June 2017

Rejestracja i analiza godzinowego oraz dobowego zużycia wody w wybranych systemach wodociągowych na terenie województwa małopolskiego

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Streszczenie: Celem projektu badawczego była analiza i ocena wielkości i nierównomierności zużycia wody w aspekcie potrzeby aktualizacji branżowych wytycznych projektowych wybranych elementów systemów wodociągowych. W pracy przedstawiono analizę wyników badań w małym wodociągu wiejskim funkcjonującym we wsi Nowa Góra (woj. małopolskie, gm. Krzeszowice). Badania zrealizowano w okresie sześciu kolejnych miesięcy począwszy od 1 sierpnia 2016 r. Średnie dobowe zapotrzebowanie wody na przeliczeniowego mieszkańca w analizowanym systemie wodociągowym wyniosło 152,9 $dm^3 \cdot PM^{-1} \cdot d^{-1}$, przy minimalnej zaobserwowanej wartości 103,9 $dm^3 \cdot PM^{-1} \cdot d^{-1}$ oraz maksymalnej 332,6 $dm^3 \cdot PM^{-1} \cdot d^{-1}$. Średnie dobowe zapotrzebowanie na wodę w przeliczeniu na jedno przyłącze wodociągowe wyniosło 0,38 $m^3 \cdot przył^{-1} \cdot d^{-1}$, przy czym wartości oscylowały między 0,26 a 0,83 $m^3 \cdot przył^{-1} \cdot d^{-1}$. Obliczona wartość współczynnika nierównomierności dobowej dla analizowanego okresu wyniosła 2,17, a współczynnik nierównomierności godzinowej osiągnął wartość 1,67. Dodatkowo, analizy statystyczne wykonane za pomocą metody analizy skupień wykazały istotne zróżnicowanie zmienności zapotrzebowania na wodę w przeciągu doby w dni powszednie oraz soboty, niedziele i święta. Mając na uwadze powyższe wyniki analiz, stosując metodę *k*-średnich, wyznaczono średnie godzinowe rozkłady zapotrzebowania na wodę dla dni powszednich i dni wolnych od pracy. Ponadto można stwierdzić, że zarówno w przypadku dni powszednich, jak i dni wolnych od pracy, występują dwa maksima (poranne i wieczorne).

Słowa kluczowe: system wodociągowy, zużycie wody, nierównomierność zużycia wody

Recording and analysis of hourly and daily water consumption in selected water intake stations in the Małopolska Region

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Abstract: The purpose of the research project was to analyse and evaluate the volume and variability of water consumption for the purpose of updating design guidelines for selected elements of water supply systems. The paper presents an analysis of hourly and daily water consumption in small, rural water intake stations located in the village of Nowa Góra (Małopolska Region, Krzeszowice municipality). The study was conducted over the period of 6 consecutive months starting from August 1, 2016. The average water consumption per capita was 152.9 $dm^3 \cdot conv^{-1} \cdot d^{-1}$, with the minimum observed value of 103.9 $dm^3 \cdot conv^{-1} \cdot d^{-1}$ and maximum 332.6 $dm^3 \cdot conv^{-1} \cdot d^{-1}$. The average water consumption per farm was 0.38 $m^3 \cdot Farm^{-1} \cdot d^{-1}$, where values were between 0.26 and 0.83 $m^3 \cdot Farm^{-1} \cdot d^{-1}$. The calculated value of daily inequality for the analysed period was 2.17 and the coefficient of hourly inequality reached the value of 1.67. Furthermore, the statistical analysis, performed using the cluster analysis method, showed significant differences in the variation of water consumption between weekdays and Saturdays, Sundays and holidays. Taking into account the results of the analyses, performed using the K-means clustering method, the mean hourly distributions of water demand for weekdays and holidays were determined. In addition, two maximum values (morning and evening) were calculated for both weekdays and public holidays.

Keywords: water supply network, water consumption, variability of water consumption

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Wpływ antropopresji na rozmieszczenie i parametry hydrauliczne siedlisk rzeki o charakterze nizinnym na przykładzie Nidy

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Streszczenie: Celem projektu było określenie wpływu regulacji technicznej na rozmieszczenie i parametry hydrauliczne siedlisk w rzece o charakterze nizinnym na przykładzie Nidy. Został on zrealizowany poprzez porównanie hydraulicznych warunków przepływu, niezwykle istotnych z punktu widzenia ekosystemu rzek w siedliskach – jednostkach morfologicznych zarówno na odcinku naturalnym rzeki, jak i poddanym regulacji przebiegu koryta. Badania przeprowadzono na dwóch około 300-metrowych odcinkach Nidy: uregulowanym w okolicach Sobowic (powyżej Pińczowa, długość 350 m, spadek 0,04%, natężenie przepływu – 8,05 m^3/s, szerokość koryta ok. 30 m) oraz nieuregulowanym w okolicach Pasturki (poniżej Pińczowa, długość 250 m, spadek 0,06%, natężenie przepływu – 12,57 m^3/s, szerokość koryta od 15 do 40 m). Badania polegały na przeprowadzeniu pomiarów konfiguracji dna cieku i natężenia przepływu wody w trakcie pomiarów za pomocą sondy ADCP Sontek (Acoustic Doppler Current Profiler). Na podstawie przeprowadzonych pomiarów konfiguracji dna rzeki zbudowano modele hydraulicznych warunków przepływu w oprogramowaniu CCHE2D. Na badanych odcinkach wyznaczono jednostki morfologiczne jako synonimy siedlisk w oparciu o konfigurację dna cieku: rynny, przegłębienia i odcinki przejściowe. Następnie przeprowadzono szereg symulacji parametrów przepływu w oprogramowaniu CCHE2D GUI dla różnych wartości natężenia przepływu niższych od pomiarowego. Analizie poddano uśrednione w pionie i na obszarze jednostek parametry przepływu wody: głębokość przepływu d [m], prędkość v [m/s], naprężenia styczne τ [N/m^2], przepływ jednostkowy q [m^3/s], liczba Froude'a [-]. Na odcinku uregulowanym prędkość przepływu jest podobna we wszystkich wyznaczonych jednostkach względem sie-

bie w całym zakresie obliczanych przepływów, na odcinku naturalnym widoczne jest większe zróżnicowanie prędkości. Często wypłycenie i przegłębienie charakteryzuje się podobnymi prędkościami uśrednionymi w pionie, jednak nie można tych warunków hydraulicznych uznać za podobne ze względu na różnicę w głębokości, przepływ jednostkowy jest znacznie większy na przegłębieniu niż na wypłyceniu. Również liczba Froude'a nie odzwierciedla oczywistych różnic w warunkach hydraulicznych między przegłębieniem a wypłyceniem, ze względu na ujednolicenie wartości dla niskich prędkości przy małych napełnieniach, jak i wysokich prędkości przy dużych napełnieniach. Do analizy warunków hydraulicznych nie jest wystarczający jeden parametr hydrauliczny, należy więc posługiwać się kilkoma charakterystykami przepływu dla pełnej weryfikacji rzeczywistych warunków przepływu wody. Bezpośrednia antropopresja w postaci regulacji koryta rzecznego przez wyrównanie koryta prowadzi do zaniku siedlisk ichtiofauny o zdywersyfikowanych parametrach przepływu wody wymaganych na różnym etapie rozwoju populacji poszczególnych gatunków.

Słowa kluczowe: regulacja rzek, jednostki hydromorfologiczne, siedliska rzeczne, warunki przepływu wody

The effect of anthropopressure on the distribution and hydraulic parameters of lowland river habitats illustrated with the example of Nida river

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Abstract: The purpose of the project was to determine the impact of technical regulation on the location and hydraulic parameters of habitats in a lowland river, as illustrated with the example of Nida river. It was implemented by comparing the hydraulic flow conditions, which are extremely important from the point of view of the river ecosystems in habitats – i.e. morphological units both in the natural stretch of the river and in the natural course. The study was carried out on two 300-meter sections of Nida: a regulated one (above Pińczów, length 350, bed slope – 0.04%, discharge – 8.05 m^3/s, width of about 30 m) and a natural one (below Pińczów, length 250 m, slope 0.06%, discharge – 12.57 m^3/s, width 15 to 40 m). The study consisted of measuring the bed topography and performing water flow measure-

ments using the ADCP Sontek (Acoustic Doppler Current Profiler). Based on the riverbed configuration, models of hydraulic flow conditions were developed using the CCHE2D software. Morphological units were designated as synonyms of habitats based on the riverbed topography: shallow water, deep water and transition areas. Then a series of water flow simulations were performed using the CCHE2D GUI software for different discharges (lower than the measured one). The water flow parameters were analysed: flow depth d [m], velocity v [m/s], shear stresses τ [N/m^2], unit discharge q [m^3/s], Froude number [-]. On the regulated section, the flow velocity was similar in all the units determined relative to one another in the whole range of calculated flows. Velocity variation between habitats was visible on the natural section. Often the deep water and shallow water were similar in terms of vertically averaged velocities, but their hydraulic conditions could not be considered as similar due to the difference in depth value. The unit flow was much larger in deep water. Also, the Froude number did not reflect the obvious differences in the hydraulic conditions between the deep water and the shallow water due to the unification of values for low velocity at low depth compared to high velocity at high depth. Therefore, it is not enough to use one hydraulic parameter to analyse the hydraulic conditions, instead, several flow characteristics should be used for full verification of the actual water flow conditions. Direct human pressure on riverbed regulation leads to the disappearance of ichthiofauna habitats with diversified water flow parameters required at different stages of populations' development of individual species.

Keywords: river regulation, hydromorphological units, river habitats, water flow conditions

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Stan jakości, walory użytkowe oraz dynamika zmian parametrów fizykochemicznych wód dopływających i odpływających ze zbiornika „Skrzyszów"

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Streszczenie: Celem pracy badawczej było określenie jakości i walorów użytkowych oraz przebiegu zmian wartości i stężeń wybranych parametrów fizykochemicznych wód dopływających i odpływających ze zbiornika retencyjnego „Skrzyszów". Zbiornik jest położony w powiecie tarnowskim, w województwie małopolskim i stanowi pierwszą, oddaną do użytku w październiku 2014 r., zrealizowaną inwestycję w ramach „Programu Małej Retencji Województwa Małopolskiego". Zakres prac wykonywanych comiesięcznie w okresie od czerwca 2016 r. do lutego 2017 r. obejmował hydrochemiczne pomiary prowadzone bezpośrednio w potokach, pobór próbek wody do analiz oraz badania laboratoryjne wykonane w laboratorium Katedry Melioracji i Kształtowania Środowiska Uniwersytetu Rolniczego w Krakowie. Próbki wody do analiz były pobierane w trzech punktach kontrolno-pomiarowych – na ciekach zasilających zbiornik (potok Korzeń – pkt 1; dopływ z Trzemesnej – pkt 2) i na odpływie ze zbiornika (potok Korzeń – pkt 3). Oznaczono i poddano analizie 16 wybranych wskaźników fizykochemicznych. Jakość (potencjał ekologiczny) i walory użytkowe wód oceniono zgodnie z obowiązującymi rozporządzeniami MŚ. Wyniki badań zostały poddane analizie statystycznej, której celem było określenie przebiegu zmienności wartości poszczególnych wskaźników fizykochemicznych oraz istotności różnic wartości wskaźników pomiędzy punktami pomiarowo-kontrolnymi. Potencjał ekologiczny wody płynącej w potokach zasilających zbiornik był poniżej dobrego. Niespełnienie wymogów klasy II jakości wód powierzchniowych stwierdzono w przypadku większości wskaźników charakteryzujących zasolenie, a także zawiesiny ogólnej i ChZT-Mn. Potencjał eko-

logiczny wody odpływającej ze zbiornika potokiem Korzeń był również poniżej dobrego. Przekroczone wartości graniczne dla II klasy jakości stwierdzono w przypadku wskaźników zasolenia i ChZT-Mn. Badane wody dopływające i odpływające ze zbiornika, głównie ze względu na zbyt wysokie zawartości azotynów (NO_2), nie spełniają kryteriów, jakim powinny odpowiadać wody powierzchniowe będące naturalnym środowiskiem życia dla ryb łososiowatych i karpiowatych. Stwierdzono, że wartości ChZT-Mn, N-NH_4 i N-NO_2 były istotnie wyższe w wodzie odpływającej w stosunku do wód zasilających zbiornik, natomiast wartości stężeń Cl, Ca, N-NO_3 i wartości przewodności elektrolitycznej w dopływie z Trzemesnej oraz stężenia Mg w potoku zasilającym, Korzeń, były istotnie wyższe, niż w wodzie odpływającej ze zbiornika. Potoki zasilające wielofunkcyjnie wykorzystywany zbiornik małej retencji „Skrzyszów", a także wody z niego odpływające powinny zostać objęte monitoringiem stanu czystości wód.

Słowa kluczowe: potencjał ekologiczny wód, wskaźniki fizykochemiczne, potok Korzeń, Trzemesna

Quality, utility values and dynamics of the changes in physicochemical parameters of water inflowing and outflowing from the "Skrzyszów" water reservoir

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Abstract: The aim of the paper was to establish the quality and utility values, and to determine the course of variations in the values and concentration of selected physiochemical parameters of water inflowing and outflowing from the "Skrzyszów" water reservoir. Reservoir is located in the Tarnów county, in the Małopolska region and it is the first, investment project, commissioned in 2014 to be impemented as part of the Small Retention Programme for the Małopolska Region. The scope of works performed on monthly basis between June 2016 and February 2017 consisted of hydrochemical measurements undertaken directly in the rivers, acquisition of water samples for further analysis, and laboratory tests performed by the Department of Land Reclamation and Environmental Development laboratory. Water samples for the analysis have been acquired in three control-measuring points – on streams inflowing (Korzeń stream – point 1, and

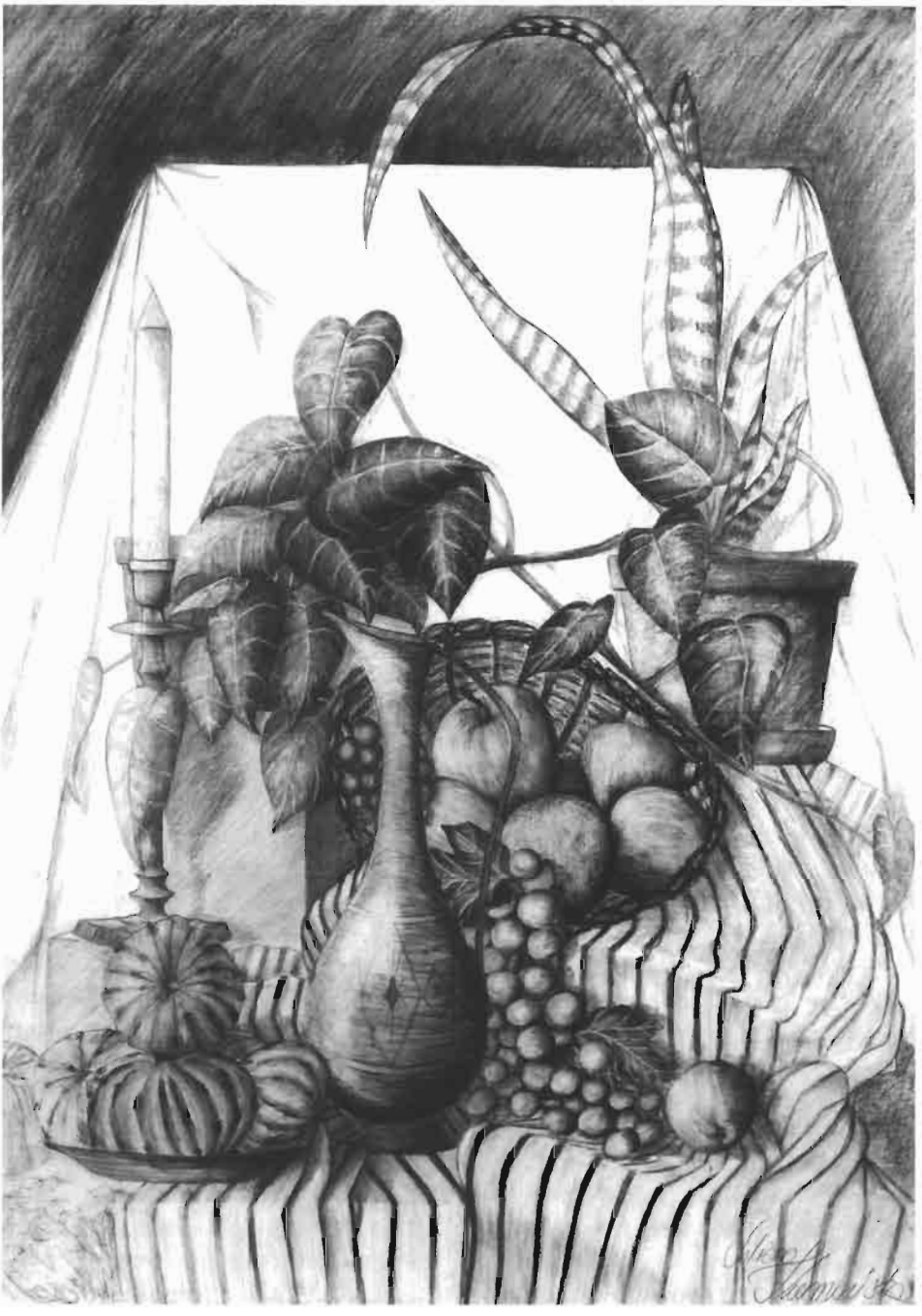
inflow from Trzemesna - point 2) and in the outflow from the reservoir (Korzeń stream - point 3). 16 selected physiochemical markers were selected and analyzed. The quality (ecological potential) and utility values of waters have been assessed according to the currently valid regulations issued by the Minister of the Environment. The results of the investigations have been subjected to statistical analyses in order to determine the course of changeability in the values and concentrations of selected physiochemical indices, and the significance of differences between the control-measuring points. Ecological potential of water in the inflow streams was below good. It was observed that most of the indices denoting salinity, total suspended solids and COD-Mn did not comply with the regulations for the II purity class of surface waters. Ecological potential of the outflow water of Korzeń stream was also below good. Salinity and COD-Mn limits were exceeded. The analysed waters inflowing and outflowing from the reservoir, mostly due to the excessive values of nitrites presence, do not meet the quality criteria for the surface waters to provide a natural habitat for the Salmonid and Cyprinid fish. It has been established that the values of COD-Mn, ammonium nitrogen and nitrite nitrogen were statistically significantly higher in the outflows than in the inflows, whereas the values of chlorides, calcium, nitrate nitrogen, and the conductivity in the inflow from Trzemesna as well as the magnesium concentration in the Korzeń inflow stream were statistically significantly higher than in the outflow. Inflow and outflow streams of the small retention "Skrzyszów" water reservoir should be subjected to a water cleanness monitoring program.

Keywords: ecological potential of water, physicochemical indices, Korzeń stream, Trzemesna

Still Life
Author: Franciszek Tokarczyk, Landscape Architecture
Work done under the direction of: Michał Uruszczak, PhD Eng. Arch.

Still Life
Author: Monika Hryniewicka, Landscape Architecture
Work done under the direction of: Michał Uruszczak, PhD Eng. Arch.

Still Life
Author: Anna Kudzia, Garden Art
Work done under the direction of: Michał Uruszczak, PhD Eng. Arch.



Still Life
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FluidSTORY project: an innovative solution for storing energy under the ground

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The FluidSTORY project, co-financed by the French National Research Agency (ANR) and initiated in 2016, is studying the feasibility of an innovative solution for underground energy storage, the principle being to transform surplus electricity into methane. France is targeting to double the part of renewable energy in its electric mix by 2030. Most of the different renewable energy sources (wind, sun) are intermittent. In order to find a good match between demand and production of energy and to guarantee the stability of the network, it is important to find solutions to massively store energy and to restore it when needed. One of the most promising solutions is to store electricity using gas (Power-To-Gas). The concept of Electrolysis-Methanation-Oxycombustion (EMO) consists in transforming the surplus electricity into methane. The operation takes place in two stages: production of hydrogen by electrolysis of water and then of methane by reaction with CO_2. This process therefore involves the temporary, massive and reversible storage of a large quantity of fluids (oxygen, CO_2 and methane).

In this project, we study the possibility to store these fluids in saline cavities, present in thick and deep layers of salt. The main objective of the FluidSTORY project is to study the feasibility, safety and integrity of energy storage in such cavities, as well as the conditions to be met in the medium to long term (2030–2050) by France, in order to achieve the energy and economic profitability of the EMO concept. The project thus includes an economic component to estimate storage requirements and the energy context in which the process could provide a solution. At the same time, a systematic inventory of existing cavities and geological formations capable of harboring new cavities will make it

possible to check the availability of potential storage volumes and to inventory their characteristics in France. Should each fluid be stored in separate cavities or in the same volume? What equilibrium will these gases find with respect to the residual water that can be found in these cavities? What are the risks to anticipate, in the operating phase or site closure? An important part of the project will be devoted to studying the various technical and environmental issues raised by such geological storage.

Keywords: renewable energy sources, methane, storing energy, saline cavities

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Inscrire l'action de l'IRD au cœur des enjeux contemporains du développement durable

JEAN-MARC CHÂTAIGNER

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L'IRD a pour ambition de se positionner stratégiquement dans le paysage scientifique national, européen et international, pour écouter, comprendre, analyser et accompagner les mutations en cours dans les Suds et éclairer les prises de décisions publiques au Nord.

Cette ambition doit s'inscrire dans le cadre du programme mondial pour un développement durable adopté par l'Assemblée générale des Nations unies en septembre dernier.

L'agenda 2030 pose le cadre de la coopération internationale pour un développement durable dont l'application se propose d'être universelle. Il transcende les frontières traditionnelles entre les programmes de lutte contre la pauvreté (les Objectifs du Millénaire pour le Développement – OMD – adoptés en 2000) et les programmes environnementaux (engagés lors des conférences de Rio de 1992 et 2012), en regroupant ces deux enjeux sous un même programme d'actions. Le besoin de cohérence et de synergie entre ceux-ci appelle au renforcement des recherches interdisciplinaires et internationales, mais également de la place de la science dans le processus décisionnel. La négociation climat fait – entre autres – partie de cet agenda. A une dizaine de jours de la COP21, je souhaiterais partager avec vous quelques messages clés.

1. L'observation sur un temps long des variations climatiques et plus globalement des processus environnementaux est incontournable pour répondre à différents enjeux sociaux liés au changement climatique tels que les ressources en eau, l'agriculture et la sécurité alimentaire, la préparation aux catastrophes naturelles, la santé et les pandémies, la production d'énergie

et la gestion des zones côtières. A travers la compréhension, sur un temps suffisamment long, des variations des processus environnementaux et des grands cycles, dans un contexte de changement climatique et de développement accéléré des activités humaines, le renforcement des observatoires de l'environnement vise à distinguer ce qui relève des impacts liés au changement climatique de ce qui relève des cycles naturels, mieux évaluer les impacts environnementaux et sociaux du changement climatique, mieux appréhender la dynamique des évènements extrêmes afin de mesurer le risque et dans la mesure du possible le prévenir, et enfin participer à la mise en place de politiques publiques efficaces.

2. La restauration des sols afin d'augmenter le stockage du CO2 est une voie prometteuse qui permet aussi de s'attaquer aux enjeux de sécurité alimentaire, de nutrition ou de sécurisation des emplois agricoles. La proposition soulève de nombreuses questions scientifiques, pour évaluer et identifier les pratiques culturales les mieux adaptées. L'IRD est un des initiateurs du programme scientifique 4/1000 lancé à la COP21 (Eco&Sol, IEES).

La science du climat ne peut être qu'universelle et doit se nourrir des connaissances académiques, traditionnelles disponibles ou produites sur le climat partout dans le monde. L'IRD à sa place et dans ses domaines de compétences entend contribuer, dans les pays ou il intervient et en liaison étroite avec ses partenaires, à la production, la mise en partage de ces connaissances et à la meilleure insertion des communautés scientifiques avec lesquelles il collabore dans les réseaux internationaux et dans les interfaces science politique des pays.

Keywords: an equitable scientific partnershipand co-publications with partnersin developing countries, solutions which are adapted to globalchallenges and based on scientific evidence

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Regulacje prawne a rozwiązania uszczelnień dla wybranych składowisk odpadów

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Wymogi dotyczące lokalizacji, budowy, eksploatacji i zamknięcia składowisk odpadów muszą zapewnić bezpieczne dla zdrowia ludzi i dla środowiska składowanie odpadów oraz zapobiec zanieczyszczeniu wód powierzchniowych i podziemnych, gleby, ziemi i powietrza, na co wskazali Moo-Young i współpracownicy w swoich badaniach z 2004 r. i Wysocka w 2015 r. Priorytetem ustawodawcy jest zapewnić ochronę zdrowia i życia ludzi oraz ochronę środowiska. Przed 2000 r. prawodawstwo Polskie bardzo ogólnie określało zasady lokalizacji składowisk odpadów, czego wynikiem są istniejące obecnie składowiska, których położenie i zabezpieczenie jest sprzeczne z obowiązującymi przepisami. Opierając się na aktualnych przepisach, przedstawiono analizę lokalizacji i stanu technicznego miejsc składowania. Jako przykład wybrano obiekty w Pilźnie i w Borszowicach. Na terenie prezentowanych składowisk odpadów komunalnych występują następujące rodzaje gruntów: Pilzno – gliny zwietrzelinowe stanowiące naturalną warstwę nieprzepuszczalną. Ograniczają one możliwość migracji odcieków do przepływającej w odległości 3 km rzeki Wisłoki. Podstawę izolacji składowiska z Pilźnie stanowi mineralna przesłona izolacyjna o grubości 1,25 m. Użyte do budowy grunty ilaste posiadają współczynnik filtracji nie mniejszy niż $1 \cdot 10^{-8}$ m $\cdot$ s^{-1}.

Podłoże składowiska w Borszowicach tworzą głównie grunty spoiste. Są to iły pylasto-piaszczyste. Grunty sypkie pojawiają się incydentalnie. Wymienić można tutaj piaski średnie o miąższości 0,6–1,3 m, występujące na głębokości 7 m. Przesłonę przeciwfiltracyjną stanowi mineralna przesłona izolacyjna wykonana z gruntów gliniastych o współczynniku filtracji $\geq 1 \cdot 10^{-8}$ m $\cdot$ s^{-1}. Grubość przesłony nie przekracza 0,4 m.

Stwierdza się, że istniejące grunty podłoża nie mogą stanowić, zgodnie z Rozporządzeniem Ministra Środowiska z dnia 30 kwietnia 2013 r. w sprawie składowisk odpadów, naturalnej bariery mineralnej, gdyż nie spełniają wymogu wartości współczynnika wodoprzepuszczalności. Uzupełnienie izolacją syntetyczną nie jest gwarancją zabezpieczenia podłoża składowisk przed odciekami. W dokumentacjach omawianych obiektów zwraca uwagę brak szczegółowego opisu technicznego zabezpieczenia dna składowiska. Projekty składowisk w Pilźnie i w Borszowicach posiadają jedynie charakterystyczne przekroje uszczelnienia dna składowiska. Jest to częsta sytuacja występująca w archiwum zarządcy kilkudziesięcioletnich składowisk.

W starych składowiskach bez zabezpieczeń przeciwfiltracyjnych w podłożu dalsza ich eksploatacja uwarunkowana jest naprawą zaniedbań przez wprowadzenie odpowiednich uszczelnień dna, skarp i powierzchni. Zabezpieczenie przed przedostawaniem się zanieczyszczeń w wodach gruntowych może być zrealizowane jako wykonanie uszczelnienia bocznego, które stosowane jest w gruntach o podłożu nieprzepuszczalnym o sporej miąższości. Zastosowanie pionowych przesłon przeciwfiltracyjnych wraz z opaskowym systemem drenaży odcieków izoluje zanieczyszczenia w bezpośredniej bliskości składowiska.

Słowa kluczowe: składowiska odpadów, lokalizacja, bariera nieprzepuszczalna

Legal regulations versus types of sealing in selected landfill sites

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Requirements concerning location, building, operation and closing of landfill sites must ensure that the waste disposal is safe for the human health and the environment, in addition they must also prevent contamination of the surface and ground waters, soil and air. The legislator's priority is to provide protection for human life and health as well as the environment. Before 2000 the Polish law very generally determined the rules for location of landfills. As a result nowadays there exist landfills, whose location and sealing is against the current regulations.

Based on the presently existing regulations, an analysis of the location and technical state of landfills was presented. As an example, two facilities were chosen – in Pilzno and Borszowice. In the area where the aforementioned landfills are

located there are the following types of soils. In Pilzno, it is weathered clay, which is a natural impermeable layer. It limits the possibility of leachate migration to the Wisłoka River that flows 3 km from the landfill. The main element of the sealing in Pilzno landfill is a mineral liner that is 1.25 m thick. The filtration rate of the clayey soil that was used to build it is no lower than $1 \cdot 10^{-8}$ m $\cdot$ s^{-1}.

The subsoil of the landfill in Borszowice is formed mainly by cohesive soils – silty sandy clays. Non-cohesive soils occur incidentally; we might mention medium-grade sands with a thickness of 0.6–1.3 m, at a depth of 7 m. An anti-filtration barrier is a mineral liner formed from clayey soils with filtration rate of $\geq 1 \cdot 10^{-8}$ m $\cdot$ s^{-1}. The thickness of the liner does not exceed 0.4 m.

It has been concluded that the existing substrate, in accordance with the Regulation by the Minister of the Environment on landfills, dated 30 April 2013, cannot be construed as natural mineral barrier because it does not fulfill the requirements concerning the filtration rate. Adding a synthetic liner does not guarantee that the subsoil will be protected from leachate. Lack of a detailed, technical description of the liner is apparent in the documentation of these landfills. The designs of landfills in Pilzno and Borszowice include only typical cross sections of the liner. This is a common occurrence in the archives of landfills that are several decades old.

In old landfills without an anti-filtration protection in the subsoil, their further operation is conditioned by the repair of that negligence, by means of adding a suitable sealing of the bottom, slopes and top of the landfill. A side sealing, which is used when there is a thick layer of impermeable soils in the ground, can be used as a protection against the migration of contaminants to the ground waters. Using vertical anti-filtration barriers with a band drainage system for leachate isolates the contamination in close proximity to the landfill.

Keywords: landfill, location, anti-filtration barrier

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Soil indicators as a tool for environmental management

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In their cognitive quest, concerning the operation of mechanisms shaping the environment and the changes that they bring about in the functioning of the entire natural system, as well as the associated effects of spatial differentiation of the properties displayed by the individual components, people look for the simplest yardsticks and indicators. On the one hand, these measures ought to provide a precise instrument allowing for the evaluation of the regularities involved, and on the other hand, they should enable the attainment of the possibly broad and reliable information on the object of study, that is, the natural environment.

The presentation shows the value of soils as indicators used in the study of environmental diagnosis and management. Possibilities are shown for making use of the direct and indirect indicators, and for the evaluation of changes taking place in the natural systems under the influence of natural and man-made external factors. It is demonstrated, on the basis of the analysis performed, that in view of the interactive connections with other elements of the natural environment, soils are endowed with high utility as indicators in the assessment of changes occurring in the entire natural system.

The heterogeneity of the soil cover, being the consequence of the spatial and temporal differentiation of the pedogenic factors, is the source of information on the functioning of the natural environment in dynamic geographical settings.

The soil-related indicators and measures may have a direct character, that is – they may be constructed on the basis of results from the field and laboratory measurements, or they may have an indirect character, referring to the location of a given diagnostic horizon along the vertical cross-section (including, in particular, the hidden chronosequences, the lithological-soil stratigraphy), or of a given pe-

don in the spatial mosaic of the soil cover (including toposequences and uncovered chronosequences).

Applications of soil indicators are mostly found in such contexts as the diagnosis of the natural environment condition and its palaeogeographic reconstruction, the assessment of resistance of habitats to anthropogenic factors, and the determination of the degree of their transformation, as well as other functional applications. They constitute a very important contribution to environmental management.

Keywords: environmental management, soil indicators

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Adaptation of environmental system in urban areas into the climate change

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During relatively rapid changes of climate, urbanized areas are particularly vulnerable to increasing frequency of heat waves and intensification of torrential rainfalls. Such areas are characterized by the high density of population, specific spatial structure, with a large share of built-up areas and decreasing share of biologically active compounds.

This results in an enlargement of the areas under impact of urban heat island, which as a consequence of the synergy effect, with aging residents, triggers the lowering of the quality of human life and even increased risk of mortality in terms of inflow of hot air waves. The aim of this presentation is to show – using the example of Warsaw – how the changes in land use structure during the next 50 years may worsen the quality of life for the residents, increase the risk of floods, or increase the risk of elderly people and children mortality due to heat waves.

Moreover, the demographic standing of Polish cities will be shown in terms of the age structure of the inhabitants. Particular attention will be focused on the issues of changes in land cover, green infrastructure, the functioning of ecological corridors and wedges aerating the city, with urban sprawl as a result of strong sub-urbanization processes. Negative consequences of climate changes will be presented along with proposals of adaptations of the environmental system thereto.

Keywords: climate change, adaptation, urban area

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Role of microbial symbionts in alleviation of plant stress

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During their life cycle, plants are challenged by a plethora of environmental stresses, including soil and atmospheric water deficit. The latter is common not only for arid/semiarid regions, but also concerns temperate grasslands and forests or even tropical rainforests. Plant responses to water deficiency are complex, encompassing morphological and physiological changes, which are prone to modifications by the superimposition of other stress factors.

Establishing symbiosis with microorganisms may serve as a solution for the water scarcity problem. In beneficial or neutral plant-microorganism interactions, the plant gives shelter to its symbiotic partner and provides it with reduced carbon. In return, the plant receives nutrients, water and a number of growth supporting and stress protecting substances from the microorganism. Soil microorganisms can adapt to unfavorable conditions and develop stress tolerance, at the same time improving the performance of plants. Symbionts colonize plant tissues above, and below-ground, inside and on the surface of the plant. Among them, there are soil bacteria, mycorrhizal fungi, endophytic bacteria and fungi. The rhizosphere is usually abundant in a wide diversity of soil bacteria, which are nourished by root exudates and/or they colonize root tissues. Soil bacteria either interact directly with the plant or they affect soil properties, supporting or inhibiting plant growth. The plant-soil interface is further extended by a diversity of mycorrhizal fungi that differ in taxonomy, morphology and ecology, accompanying plants since their appearance on land, almost 500 million years ago. The fungus expands the plant's absorptive surface and gives mycorrhizal plants a competitive edge over non-mycorrhizal plants, particularly in challenging environments. Last but not least, plants are inhabited by bacteria and fungi called endophytes. These organisms, recruited mostly from the rhizosphere, live asymptotically within the plant where they take

refuge and affect a range of physiological features, creating diverse endosymbiotic communities within plant tissues. These microorganisms can support the host by producing growth hormones, inducing stress tolerance, fixing nitrogen and stimulating photosynthesis.

All of these interactions are subject to mutual, complex regulations, involving the production and reception of signals modulating the quantity, quality and activity of microbial populations and the plant hosts. Today, there is a growing interest in understanding the microbial involvement in the development of plant response to stress factors and opportunities open for the optimal use of associations that spontaneously occur in nature.

Keywords: soil microorganisms, symbiosis, response to stress

Experience of the National University of Water and Environmental Engineering in solving water management problems

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National University of Water and Environmental Engineering is one of the oldest universities, and a leading institution in the field of water management in Ukraine. It was founded more than one hundred years ago and since then became the leader in BSc-level studies in water management, construction, mechanics, ecology, economics, and other fields related to water management.

Today the University runs 40 Bachelor-level programs, 47 Master-level programs, and 11 PhD programs in 24 scientific specialties, 2 DSc programs in 7 scientific specialties, with more than 12 thousand students and 650 academic staff in 8 research and educational institutes.

Research and Education Institute of Water Management and Environmental Engineering is among the oldest and best known units of the University. The Institute is the leading institution in Ukraine for training specialists in water management, and it is extremely important for other industries – agriculture, hydropower, energy, construction and mining. During the university's history, diplomas in water management engineering were granted to more than 20 thousand professionals who work in Ukraine and abroad.

The main scientific directions of the Institute's departments include the following: hydraulics of downstream hydrotechnical constructions; the theory of filtration in deformable environments; filtration and physical modeling of deformation processes; the theoretical basis and practical methods for comprehensive regulation of mountain river beds using hydromorphological theory of fluvial processes; flood management and flood protection of settlements and areas with high flood waters; improving the ecological condition of irrigation and drainage of land, groundwater, as well as ecological rehabilitation of small rivers and lakes; techniques, methods and means of water metering for water management objects; technology and

technical means for water treatment and wastewater systems for agricultural water supply; technical means of irrigation water treatment; monitoring of reclaimed land, canals, structures, small rivers and other objects with the aim to obtain an objective assessment of their condition; improving the reliability of irrigation and drainage systems and water management objects; transient processes in piping systems; monitoring and increasing the operational reliability of rice irrigation systems in the Danube Delta.

The Institute possesing a unique scientific laboratory, enabling us to perform hydraulic modeling of different kinds of hydrotechnical structures, especially in the aspect of riverbed erosions, flood protection and others.

For the last ten years, members of academic staff have taken part in such scientific projects as: Hydraulic modeling of different hydrotechnical structures (accumulating polders, water intake construction with shutters) at the river Tisa basin; Construction of flood protection reservoirs at Borzhava river; Research of adhesion between repair composites and concrete for objects on the Dniester pumped-storage hydroelectricity station; Recommendations of the design and construction of flood protection dams on unconnected soils in the mountains of the Ukrainian Carpathians; Definition of economically based hydro potential of Western Bug River in the Volyn region; Study of water flow washed out capacity for the clamping areas of rivers in the Ukrainian Carpathians; Development of methods for comprehensive regulation of the rivers in the Ukrainian Carpathians based on hydromorphological theory of channel processes; Hydraulic modeling of the spillway dam of the Senge hydropower plant on Vale river in the continental part of Equatorial Guinea.

Based on the above, the experience and the unique scientific hydraulic laboratory of the National University of Water and Environmental Engineering can be the basis for future cooperation between the scientists of Poland, France, Egypt, Tunisia and other countries in the field of water resources management.

Keywords: water management, wastewater systems, irrigation

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Monitorowanie przepływu filtracyjnego przez nasypy hydrotechniczne z wykorzystaniem spektrometrii impedancyjnej

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Jednym z ważniejszych problemów dotyczących eksploatacji ziemnych budowli hydrotechnicznych są zjawiska filtracyjne. Najczęściej w celu ich monitorowania wykorzystuje się rejestrację poziomów wody w piezometrach. Pewną alternatywą dla nich może być metoda spektrometrii impedancyjnej wykorzystująca zmiany oporności gruntu na skutek zmian jego wilgotności wynikających z przepływu wody. Metoda ta jest od wielu lat wykorzystywana w inżynierii środowiska do oceny zmian wilgotności w ośrodkach porowatych.

Celem przeprowadzonych badań była ocena przydatności spektrometrii impedancyjnej dla potrzeb obserwacji przebiegu procesu filtracji wody przez korpus nasypu ziemnego. Badania przeprowadzono na modelu takiego nasypu o długości, szerokości i wysokości odpowiednio 200, 100 i 60 cm oraz nachyleniu skarpy odwodnej 1 : 1,5 i odpowietrznej 1 : 1. Nasyp wykonano z piasku grubego pylastego, a jego zagęszczenie odpowiadało wskaźnikowi zagęszczenia I_S = 0,95. Przepływ filtracyjny wraz ze zmianami uwilgotnienia gruntu uzyskano poprzez kilkustopniowe podnoszenie i obniżanie wody w korycie hydraulicznym.

Otrzymane wyniki badań wykazały istotną zbieżność zmian wartości oporności gruntu wywołanych przepływem wody ze zmianami położenia poziomu zwierciadła wody w piezometrach pomiarowych. Stwierdzono, że metoda ta może stanowić

narzędzie do wspomagania monitoringu obiektów hydrotechnicznych, zwłaszcza gdy obiekt wymaga rozbudowy istniejącego systemu monitorującego.

Słowa kluczowe: spektrometria impedancyjna, przepływ filtracyjny, nasyp ziemny

Monitoring of the filtration flow through hydraulic embankments using impedance spectrometry

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One of the major problems relating to the exploitation of earth hydroelectric structures is the filtration phenomena. In order to monitor them, most often water levels are measured in piezometers. An impedance spectrometry can provide an alternative method that allows determining the soil resistance changes, caused by changing soil moisture content. This method has been used for many years in environmental engineering for issues of monitoring changes in selected properties of porous media.

The study aimed to evaluate the suitability of impedance spectrometry for the observation of the process of water filtration through an earth embankment body. The tests were carried out in a hydraulic channel on the embankment model of the lengths, widths and heights of 200, 100 and 60 cm respectively, the inclination of the inner slope 1 : 1.5, and of the outer slope, 1 : 1. The embankment was made of coarse silty sand, and its compaction corresponded to the degree of compaction I_S = 0.95. The filtration flow through the embankment was obtained through multi-stage lifting and lowering of the water level in the hydraulic channel.

The obtained results showed significant convergence of changes in soil resistance due to the water flow, with changes in the water level in measuring piezometers. It was found that this method can serve as a tool to assist in monitoring hydraulic facilities, especially when these objects require expansion of the existing monitoring system.

Keywords: impedance spectrometry, filtration low, earth embankment

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Salinity Risk and Management in Tunisian Semi-Arid Areas

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In semi-arid and arid regions, sustainability of irrigated areas is a function of availability and quality of water and soil resources. These resources, limited and affected by salt, are essentially used for agricultural production. Their management constitutes an important challenge for the development of agriculture and for the preservation of the environment. In Tunisia, the use of salt-affected soils and brackish/saline water has increased during the last decade. The use of brackish/saline water is a problem that has interested researchers in Tunisia for 70 years. Research projects conducted in Tunisia have shown that it possible to use brackish/saline water without major risk by following some management rules of water and soil. Farmers do not always respect these rules, where progressive salinization in some areas presents serious risks in the short and long term. Problems of salinization already affect a significant part of irrigated areas, however, there is an important social and economic pressure to use marginal and saline water in agriculture. Furthermore, there are not enough criteria at present, and complementary research is very much needed. Adapting some research results to farmers' conditions is also necessary. Other results require further, adapted research in controlled conditions, before they can be transferred into practice. This paper focuses on the management of brackish/saline water in Tunisia. Characteristics of irrigated areas and problems of salinization will be presented. Main Tunisian experiences and ongoing research projects will be reviewed. Finally, perspectives for further research will be proposed.

Keywords: salinity, irrigation, water, soil, crops, Tunisia

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Wpływ stabilizatora hydraulicznego Terramix 22,5 na wartości wytrzymałości na ściskanie pyłu grubego

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Przeprowadzone badania miały na celu określenie wytrzymałości na ściskanie oraz ustalenie wskaźnika mrozoodporności pyłu grubego stabilizowanego spoiwem hydraulicznym Terramix F22,5. Oznaczenie tych parametrów miało na celu sprawdzenie przydatności gruntu do stabilizacji i wykorzystania w budownictwie drogowym. Grunt do badań stanowił pył gruby pobrany w miejscowości Boczkowice w województwie małopolskim. Badania polegały na określeniu wytrzymałości na ściskanie oraz wskaźnika mrozoodporności pyłu grubego stabilizowanego spoiwem hydraulicznym Terramix F22,5, przy różnych dodatkach spoiwa oraz gruntu bez dodatku stabilizatora. Dodatki spoiwa w stosunku do suchej masy wynosiły 3%, 5% oraz 8%. Wytrzymałość na ściskanie określono w prasie Tritech 50, natomiast do określenia wskaźnika mrozoodporności użyto komory mrożeniowej. Próby o wysokości i średnicy 8 cm formowano przy wskaźniku zagęszczenia Is = 1,0 i wilgotności optymalnej w aparacie Proctora. Badania przeprowadzono: a) na próbach pyłu grubego bez dodatku stabilizatora; b) bezpośrednio po uformowaniu na próbach z dodatkiem stabilizatora; c) po dodaniu stabilizatora i 7 oraz 28 dobach pielęgnacji w wodzie; d) po dodaniu stabilizatora i 7 oraz 28 dobach zabezpieczonych przed wysychaniem; e) po dodaniu stabilizatora i 7 oraz 28 dobach zamrażania i odmrażania. Na podstawie przeprowadzonych badań stwierdzono, że na poprawę wytrzymałości na ściskanie pyłu wpływa sposób pielęgnacji próbek. Natomiast próbki wykazują małą odporność na działanie wody, wytrzymałość na ściskanie w warunkach zawilgocenia wzrasta w małym stopniu w zależności od ilości zastosowanego procentowego dodatku spoiwa oraz długości okresu pielęgnacji.

Słowa kluczowe: wytrzymałość na ściskanie, stabilizacja, grunt mineralny

The influence of Terramix 22.5 on the compression strength of coarse silt

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The purpose of the research was to determine the compressive strength and the frost resistance factor of coarse silt, stabilized with a hydraulic binder Terramix F22.5. These parameters were necessary to evaluate the suitability of this soil for stabilization and road engineering. The tested soil was the coarse silt from Boczkowice in Małopolska Province. The tests included the determination of the compressive strength and the frost resistance factor of the soil without any additive as well as with varying additions of the hydraulic binder Terramix F22.5. The addition of the binder in relation to the dry mass was 3%, 5% and 8%. A Tritech 50 press was used to determine the compressive strength, and a frost chamber was used in frost resistance tests. The samples, 8 cm in diameter and 8 cm in height, were formed in a Proctor's apparatus at the compaction index I_s =1.0 and the optimal moisture content. The tests were carried out on the following samples: a) coarse silt without any addition of the binder; b) soil with the binder directly after formation; c) soil with the binder after 7 and 28 days of curing in water; d) soil with the binder after 7 and 28 days of curing (the samples were protected from drying); e) soil with the binder after 7 and 28 days of freeze and thaw cycles. Based on the tests performed, it was concluded that improvement of the compressive strength is influenced by the method of curing. Whereas the samples showed low resistance to water – the compressive strength under wet conditions increased very little in relation to the addition of the binder as well as time of curing.

Keywords: compressive strength, stabilization, mineral soil

Ecology and Environmental Science
– Reduction of Water Stress and Adaptation to Aridity
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Zmiany morfologii odcinka koryta rzeki Wisłoka w celu poprawy struktury siedlisk dla ryb

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W artykule przedstawiono działania techniczne zmierzające do zmiany morfologii koryta rzeki Wisłoka w celu poprawy struktury siedlisk dla ryb. Na odcinku rzeki Wisłoka o długości ok. 30 km (od jazu w Mokrzcu do miejscowości Pustków) wytypowano 10 odcinków, które poddano działaniom renaturyzacyjnym. Działania te ukierunkowane były na uzyskanie przestrzennego zróżnicowania warunków przepływu wody w korycie, które uzyskano przez: 1) ułożenie głazów, 2) deponowanie rumowiska wleczonego w korycie rzeki oraz 3) wymuszenie zmiany układu poziomego rzeki poprzez kontrolowaną erozję boczną brzegów. Na wybranym odcinku objętym badaniami przeprowadzono bezpośrednie pomiary przepływu wody, pomiary geodezyjne, na które składały się pomiary profilu podłużnego, przekrojów poprzecznych i układu zwierciadła wody oraz określono skład granulometryczny rumowiska tworzącego pokrywę denną. Dane te posłużyły do zbudowania modelu numerycznego odcinka cieku, na którym przeprowadzono symulacje hydraulicznych warunków przepływu wody. Po wykalibrowaniu modelu przystąpiono do modelowania wpływu różnego ułożenia głazów na przestrzenny rozkład prędkości średnich i układ zwierciadła wody. Wpływ struktury ułożenia głazów na przestrzenne rozkłady prędkości średnich i napełnień stanowiło kryterium wyboru odpowiedniej konfiguracji głazów w celu uzyskania korzystnej morfologii koryta dla występującej na tym obszarze ichtiofauny.

Słowa kluczowe: warunki siedliskowe dla ryb, renaturyzacja rzek, morfologia koryta, głazy ponadwymiarowe

Changes to the morphology of Wisłoka River channel section aimed at improving fish habitat structure

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The article presents activities aimed at changing the morphology of the Wisłoka River channel in order to improve the structure of fish habitat. 10 sections along the river reach of about 30 km (from the weir in Mokrzec to Pustków town) were selected and subjected to restoration measures. The measures comprised spatial diversification of the water flow conditions, which were achieved by: 1) placing boulders, 2) deposition of bedload in the river channel, and 3) forcing a change in the horizontal pattern of the river through controlled lateral erosion of banks.

At the selected river section covered by the investigations, direct measurements were conducted of water discharge as well as survey measurements, including longitudinal profile, cross sections and water surface level; also, granulometric composition of the bedload forming the riverbed cover was determined. The data were used to construct numerical model of the river section, along which a simulation of hydraulic conditions of water discharge was performed. Following the model calibration, the influence of various placements of boulders on mean velocity spatial distribution and water surface level were modelled. The effect of boulder placement structure on mean velocities spatial distribution and water discharges was the criterion for the selection of the boulder configuration appropriate for obtaining the channel morphology that would be beneficial to the ichthyofauna present in this area.

Keywords: fish habitat, river restoration, river morphology, boulders

Institute of Technology and Life Sciences

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The Institute of Technology and Life Sciences (ITP), located at Falenty near Warsaw, was established in 2010 based on a decree of the Minister of Agriculture and Rural Development. It emerged as a result of a fusion between the Institute of Agricultural Building, Mechanization and Electrification (IBMER – established in 1948) and the Institute for Land Reclamation and Grassland Farming (IMUZ – established in 1953).

The Institute is entitled to grant doctoral (PhD) and habilitation (DSc) degrees in agricultural sciences in the disciplines of: agronomy, agricultural engineering and environmental management.

The objective of the Institute is to conduct research and development together with the operational implementation, dissemination, advisory, education, training, promotion, inventive and monitoring activities concerning:

- agricultural engineering and technical solutions applied to crop and livestock production, including fish;
- agro-energy, including bioenergy and other renewable energy sources;
- water supply and drainage engineering, land reclamation and water resources management for agriculture, construction of buildings as well as flood protection facilities;
- construction of rural buildings and roads;
- materials engineering and operation of technical equipment in agriculture;
- engineering and technology of rural sanitation and sanitary condition of the village, along with disposal of sewage sludge, municipal waste, and waste from food processing;

- shaping and usage of the surface structure and spatial order, agriculture and rural infrastructure, system infrastructure, technical and technological management of the environment and landscape;
- conservation of nature, biodiversity and landscape in rural areas;
- economy of permanent grasslands in lowlands, foothills and mountains, feed production technology, the threats and conservation of grassland habitats, soil, and water;
- water management in agriculture and rural areas, irrigation and drainage, water shortages, flooding, inundation and water balances;
- pollution and protection of water quality, as well as wastewater and sewage management and disposal in rural areas;
- shaping the environmental conditions in agricultural buildings and reduction of greenhouse gases, odours and dust emissions from agricultural sources;
- safety of the use of agricultural machinery;
- economics, organization and mechanization of agriculture, and programs of energy development in agriculture and rural areas.

The Institute employs over 350 persons. ITP staff carry out research and development in the field of life sciences and technology, particularly concerning the protection, use, landscaping and infrastructure in rural areas, water resources, agro-ecosystems, permanent grassland, the environment and nature conservation of lowlands and mountainous areas; innovative, complex technologies in the production of crops and livestock, including fish, and food processing, technical infrastructure in the countryside, and obtaining energy from renewable sources; safety of the implemented technologies as well as the usage of machinery and equipment.

Priority challenges:

- Water for agriculture and rural areas, small retention – small-scale hydropower plants;
- Renewable energy: energy use of biomass, biogas plants for small family farms;
- Reduction of greenhouse gas emissions from agriculture;
- Bio-sequestration of organic carbon;
- Protection of grasslands and their biodiversity;
- Management in difficult terrain and agrometeorological conditions;
- Optimization of the equipment in family farms to the requirements of sustainable agriculture.

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The Małopolska Research Centre (MRC) in Kraków is an administrative unit of the Institute of Technology and Life Sciences at Falenty. MRC staff carries out studies mainly in southern Poland with particular reference to the Carpathian region, and it possesses internationally recognized professional research expertise in the scope of shaping land use structure and spatial order, protection of nature, biological and landscape diversity in mountain and sub-mountain areas, permanent grassland management, threats to and protection of meadow habitats, soil and water resources, water management in agricultural and rural areas, engineering and rural sanitation technologies, sanitary and hygienic state of rural areas, utilisation of sewage sludge, domestic and industrial waste, pollution and water quality protection.

Study subjects of MRC:

- identification and assessment of the impact of land use on selected natural resources and their value,
- recognising agricultural and non-agricultural factors which degrade soil and water habitats in municipal, agricultural and tourist small and medium-size mountain catchments,
- management and protection of agricultural landscape in hilly areas, with a view to harmonizing their social and economic functions,
- restructuring and improving land management principles in hilly areas with the consideration of ecological, social and economic equilibrium and of productive and non-productive function of grasslands,
- farming in protected areas,

- hydrological and climate changes and water balance,
- research and development in:
  - modern technologies and techniques of fodder harvesting and conservation in mountain croplands, maintenance and care of mountain landscapes,
  - environmentally friendly methods of the utilisation of natural and organic fertilisers, the use of machines and appliances for their storage and application onto mountain croplands,
  - highly effective and energy-saving methods for protecting mountain water resources, purification and utilisation of domestic sewage and effluents from constructed wetlands in agricultural areas with the consideration of biologically valuable areas,
  - technological projects of modernization and development in mountain farms with respect to binding ecological requirements,
  - low-impact farming – organic, agro-tourism and agro-forest farms,
  - farming in buffer zones of nature reserves and national parks,
  - farming under the intensive seasonal influx of tourists, vacationers and natural medicine patients.

Over the last few years, the MRC has implemented three international research projects: FINEGRASS – Effect of climatic changes on grassland growth, its water conditions and biomass (Polish-Norwegian cooperation); SaLMaR – Sustainable land and water management of reservoir catchments (Polish-German cooperation); MACSUR FACCE JPI – A detailed risk assessment of pastoral farming restitution in the Carpathians in the aspect of food security (Europe-wide cooperation).

MRC is characterized by:
- complementarity of research solutions,
- thorough recognition of environmental conditions,
- consideration of economic and social aspects.

Our research activities are conducted in long time-series of measurement and observation, some of them lasting as long as 60 years. Hence, they already have the character of historical data that constitute the background for many analytical and comparative works.

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Ecology and Environmental Science
– Reduction of Water Stress and Adaptation to Aridity
Faculty of Environmental Engineering and Land Surveying
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Research on soil and water management – a case study of the Institute of Technology and Life Sciences (ITP) at Falenty (Poland)

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The Institute of Technology and Life Sciences (ITP) located at Falenty near Warsaw was established in 2010 based on a decree of the Minister of Agriculture and Rural Development. It comprises the Institute for Buildings Mechanization and Electrification of Agriculture (IBMER) and the Institute for Land Reclamation and Grassland Farming (IMUZ).

Their research focus has a nationwide dimension regarding environmental protection, agricultural engineering, grassland management, agricultural land improvement, peat science, non-point pollution, soil science, and environmental chemistry. ITP research expertise and research projects address objectives related to the improvement of sustainable agriculture in rural areas with respect to agriculture-ecosystems, water resources, permanent grasslands as well as landscape and infrastructure of rural areas, plant and animal production, agricultural-food.

In soil and water management studies, the water requirement and deficits of cultivated crops using the Penman-Monteith method (FAO-56), which is seldom applied in Poland, was assessed. The reference crop evapotranspiration (ETo) from a hypothetical grass with an assumed height of 0.12 m, a fixed surface resistance of 70 $s \cdot m^{-1}$ and an albedo of 0.23, was used. ETo was computed by using meteorological data from 43 weather stations in the Upper Vistula River basin. The crop evapotranspiration ETc is the product of ETo, and single crop coefficient (Kc). The differences between precipitation and ETo and ETc (climatic water balances) were determined. The results were summarised in the form of a table, accompanied with maps of isohyets and isolines elaborated by applying the Geographic Information System techniques (Arc View 9) with the data interpolated by the geostatic method (Kriging).

Keywords: evapotranspiration, water requirements, deficits, crops

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Range of activity, experience, and service offer of MGGP S.A. company

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Introduction

MGGP S.A. is a Polish engineering and consultancy company operating on the market since 1998. It offers comprehensive range of services in the fields of engineering, architecture and geo-information. Through its implementation projects, MGGP S.A. participates in important investment ventures in such market segments as: infrastructure and transport, construction, environment, agriculture, energy and telecommunications. The comprehensive character of MGGP S.A. services allows the company to participate in all stages of the project: from initial planning, to design and development, to supervision and final commissioning.

1. Origins and history

MGGP S.A. was formed from the merger of four partnerships. The decision on its creation was made at the end of 1997, and on February 28, 1998 a notarial deed was signed, founding the Małopolska Grupa Geodezyjno-Projektowa S.A. (the name was changed to MGGP S.A. in 2006). On 13 September 2001, the company was registered in the National Court Register (KRS). The company's equity is made up of 100% Polish capital.

During its operations, MGGP has evolved from a small local geodetic enterprise into a large company with a broad scope of activities and a diverse range of engineering services.

The first years of MGGP's existence primarily entailed activities in the field of geo-information. The company has obtained, among others, the ability to produce topographic maps at a scale of 1:10,000, and it has also expanded the range of its offer to include photogrammetric reports, which have become the foundation for future applications and the development of laser scanning technology. Since 2002, MGGP has started to provide road, environmental, water and land planning services. One year later, MGGP signed its first project management and project supervision contracts (in the field of transport and environmental engineering). In 2004, activities in foreign markets (in Libya and Lebanon) were intensified. The following years brought continued development of the company at all levels of its activity - that is in engineering, architecture and geo-information, while the firm was also expanding its range of services offered and entering new areas of activity.

MGGP's past years of activity have enabled it to gain experience and strengthen its position in the market, and to build an organizational structure that enables it to execute projects efficiently and to ensure optimal operation. In its activities, MGGP uses the latest global technical and technological solutions, it tracks trends and advances in scientific research and promotes innovative technologies.

The seat of MGGP S.A. is the city of Tarnów. The Company has branches in Kraków, Warsaw, Gorlice and Nowy Sącz. Contact: mggp@mggp.com.pl, www.mggp.com.pl.

2. MGGP Customers

MGGP S.A. provides a very broad spectrum of services to various customer groups both in the local market, at home and abroad. The main group of customers derive from the public sector. Among the existing clients of the company, the following are listed: Agency for the Restructuring and Modernization of Agriculture, Central Office for Geodesy and Cartography, National Fund for Environmental Protection and Water Management, National Water Management Board, Regional Water Management Boards, Polish Telecommunications Company, Regional Road Administration Offices, regional self-government offices, district authorities, town councils and municipal offices.

Contracts are obtained by MGGP S.A. through public procurement procedures, based on public procurement law. Nevertheless, there in a decreasing tendency in the number of contracts originating from the above source, coupled with an increased number of contracts acquired in the commercial (private) market, visible over the last several years. MGGP S.A. implements projects directly as a contractor or indirectly as a subcontractor (in commercial contracts). In that second capacity, mostly geodetic services for investment projects are offered. Major service users in the commercial market in this area include large and medium-sized private construction companies, operating in the area of road and rail infrastructure.

3. MGGP's service offer

Offer of MGGP S.A. covers a wide spectrum of consulting, design, engineering and project management services in the areas of infrastructure, the environment, water, construction, energy and telecommunications.

The mission of the company is to assist clients in defining their needs and accomplishing their investment objectives through technical professionalism, top-level service, efficient organization of activities, and personalized approach to each project.

In order to better meet the customers' needs, the company has divided its offer into four main business segments, each of which provides individual added value. At the same time, these segments constitute an integrated system, providing comprehensive customer service.

3.1. Engineering

MGGP has 15 years' experience in preparing and managing investment processes and overseeing their implementation, while using modern and cost effective solutions. Special emphasis is placed on projects related to road and rail infrastructure, environmental protection, transmission line investments and cubature facilities.

MGGP services include the development of project concepts, detailed working designs, contract management, control, and investment supervision. The company also prepares detailed descriptions of the subject matter of the order, as well as thorough analyses of the risks and hazards that may arise during the implementation of the project.

Photo 1. Examples of engineering investment projects

Source: MGGP archive S.A.

Investment planning:

- Preparing and updating maps for design purposes,
- Reporting geodetic and cartographic work to the appropriate Geodetic and Cartographic Documentation Centres, and obtaining design usability clauses,
- Implementation of the project of division of land properties to be redeemed and obtaining valid division decisions from the relevant state administration bodies,

- Execution of estimates by property valuation experts, setting the amount of compensation for real estate, estimation by property experts of damage for land occupation,
- Obtaining the necessary paperwork and legal documents necessary for the purchase of land,
- Fieldwork, including situational-height measurement, underground measurements, point stabilization,
- Activities related to carrying out measurements for wet cross-sections, geodetic survey of channel cross-sections as well as inventory and preparation of geodetic documentation of engineering facilities,
- Obtaining permits, agreements, approvals, opinions and decisions necessary for the execution of works, particularly concerning land occupation and transport easements for power lines and gas pipelines.

Project design:

- Construction and reconstruction of roads and motorways, bridges, flyovers,
- Railways – rail system projects including roadbed and drainage, platforms, tramway line systems along with power supply systems,
- Power industry and telecommunications engineering - power network projects (low voltage, medium voltage, high voltage), telecommunications networks, road lighting, traffic lights,
- Designs in the scope of environmental protection – modernization of sewage treatment plants, inventory of vegetation cover, post-implementation analyses, environmental impact reports,
- Designs in the field of water engineering - regulation of rivers and streams,
- Project supervision.

Management of investment projects:

- Representing the investor in interaction with the contractor and third parties to the contract,
- Administration, management and coordination – monitoring the progress of works according to the agreed schedule, preparing progress reports, analysing and counteracting possible risks during the investment process,
- Financial supervision of the construction – preparation of financial settlements between the contractor and the investor, cost control during the implementation of the investment, verification and acceptance of the contractor's financial claims,
- Technical supervision – conducting regular inspections on the construction site, checking the conformity of work implementation against the contract,
- Legal supervision – settlement of disputes between the investor and the contractor.

Technical Support:

- Preparation of tender documentation (SIWZ specification) and participation in tendering procedures,
- Contract consulting, technical assistance and investor representation,
- Applications for the co-financing of investment projects,
- Social consultations and training,
- Monitoring and evaluation of projects.

3.2. Environment

The way of shaping the surrounding space is one of the most important determinants of many aspects of human life. It affects not only man's wellbeing, but it is also decisive for tourist and economic attractiveness of the area.

The task of the team dealing with space planning at MGGP S.A. is the creation of a coherent architectural, aesthetic and functional landscape. The plans, projects, and conditioning studies, developed by experts, ensure the rational use of land, the protection of public good, the improvement of the value, and thus increasing market competitiveness of the urban space.

The MGGP S.A. environmental team also supports all tasks related to environmental management, planning and protection, especially in the management and exploitation of water resources, in the effort to integrate advanced technologies with an understanding of social and economic factors in order to develop integrated and sustainable solutions. The company works with a wide range of experts and research institutes.

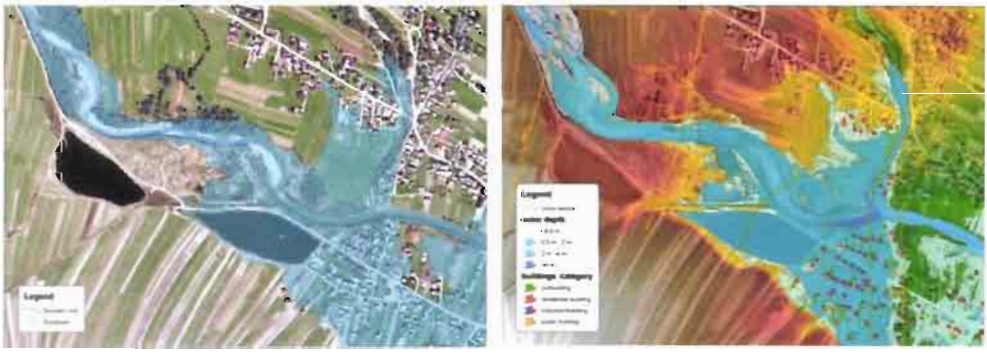

Photo 2. Sample environmental products

Source: MGGP archive S.A.

Spatial planning includes:

- Projects for the studies of conditions and directions of spatial development for municipalities,
- Projects for local spatial development plans,
- Projections of the financial implications of adopting a local plan,

- Analyses of changes in spatial planning,
- Concepts of transportation solutions to the extent necessary for their entry into the projects of local plans and studies for municipalities,
- Master Plan projects with architectural concepts, road and technical infrastructure solutions,
- Preparation of applications for obtaining a decision on the location of a public investment project (or a decision on development conditions) as well as obtaining such decisions (tasks of searching for / evaluating the parties to the proceedings, carrying out administrative proceedings in the municipality, preparation of draft decisions and obtaining necessary approvals).

Architecture:

- Architectural and land use concepts,
- Architecture and construction (execution) projects.

Environmental Protection:

- Environmental impact reports,
- Environmental impact forecasts,
- Water maintenance, flood protection, drought protection,
- Ecophysiographic studies,
- Natural inventories (vegetation cover),
- Dendrological inventories,
- Inventory of river channels including infrastructure,
- Balancing of water resources,
- Determining the conditions for using water,
- Databases describing environmental elements such as hydrography, protected areas, land cover, soil cover,
- Use of LIDAR data to designate river catchment areas and urban catchments,
- Hydraulic modelling of open watercourses and storm sewers,
- Designation of flood hazard areas, including analyses of losses and costs,
- Visibility analyses,
- Reclassification of plant communities using spectral and height data,
- GIS data processing,
- Requests to change the use of agricultural and forest land for non-agricultural and non-forest purposes,
- Requests for exclusion of agricultural and forest land from agricultural and forestry production for non-agricultural and non-forest purposes.

Consultancy:

- Advice on choosing the right investment route for the planned project (path of the local plan, path of the development decision, path of the location decision, necessary documents and decisions),
- Preparation of a complete tender dossier for the planning work, in accordance with the applicable regulations and principles of valuation of planning,

- Issuing opinions on the already developed Specification of Essential Terms of Contracts in terms of records for planning studies (non-price selection criteria),
- Development of conceptual and promotional materials for municipalities: investment offers, tourist attractions, etc.,
- Urban-planning opinions on the provisions of local spatial development plans,
- Requests for the change of land registration (change of land classification),
- Advice on the compatibility of national law with EU regulations in relation to water management.

3.3. Geo-information

The demand for information that has a spatial reference to the surface of the Earth is a result of growing interest in the issue of environmental protection and the need to keep track of the changes within the environment.

Geo-information provides the data necessary for decision-making in the management of nature's resources, in business activities, and in the organisation of social life.

MGGP S.A. is a recognized leader in geo-information services. Equipped with state-of-the-art technology, with a team of qualified and experienced staff, the company provides its customers with a ready model of space development, which meets high standards in terms of quality, accuracy and reliability and which can be used as a key decision-making tool.

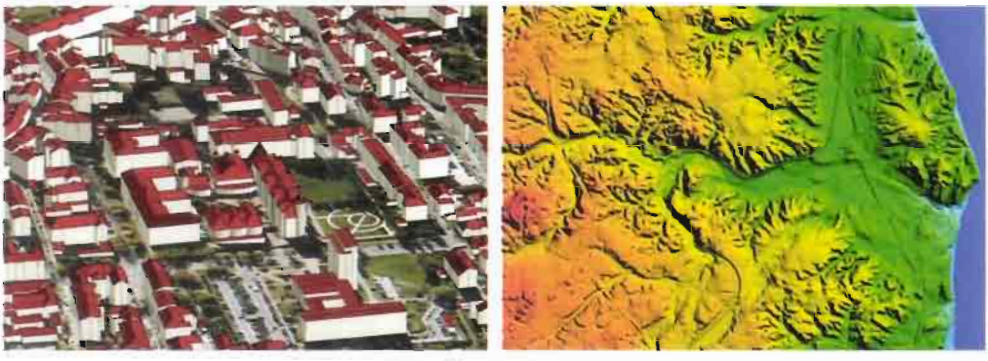

Photo 3. Sample products in the field of geo-information

Source: MGGP archive S.A.

Geodesy and Cartography:

- Comprehensive geodetic service of contracts, mainly for road and rail investments projects,
- Development of geodesic as-built documentation,
- VMap level 2 vector maps on a scale of 1: 50,000,
- Thematic maps - Hydrographic Division of Poland maps on a scale of 1: 10 000,

Photogrammetry:

- Aerial photography and laser scanning,
- Development of data obtained from laser scanning (LIDAR),
- 3D vector maps, including maps for urban space modelling and developing 3D building models, LOD 2 level detail,
- Developing DTM numerical terrain modelling and DSM numerical land cover models,
- Orthophotomaps made in real colours and in infrared.

Real estate cadastre:

- Divisions of land plots, demarcation of properties,
- Developing documentation for legal purposes,
- Construction of Land and Buildings Databases.

GIS (Geographic Information System):

- Development and updating of Topographic Data Base of objects (BDOT10k) together with KARTO BDOT10k reports,
- Passporting and supplying data for infrastructure management systems in transmission companies,
- Development of dedicated software,
- Internet portals of integrated spatial information,
- Spatial information systems for cities, counties and municipalities.

Digital Document Archiving:

- digitization, archiving and construction of technical documentation repositories.

3.4. IT services

MGGP S.A. Information Technology Department for many years has provided a number of IT services, including:

- Administration of IT infrastructure; managing a large numbers of servers, large-area arrays, advanced backup and data archiving systems, virtualization environments, and IT security components,
- Software development according to individual needs and specifications for different areas; business IT systems created by MGGP enable, among other things, the comprehensive resource management, managing staff time, managing communication, and thus they contribute to the optimization of the organization's procedures and its effectiveness; built-in production applications typically work with spatial data, providing users with a variety of data and functions on the map; mobile applications for tablets and smartphones allow for quick and efficient data exchange, and data retrieval from the terrain, such as GPS,

- Database management and programming (Oracle / MS SQL / PostgreSQL), including 2D / 3D spatial data,
- Migration and data consolidation services, within the systems such as CMS, ERP, SCADA, Business Intelligence, GIS and others,
- 2D / 3D spatial data conversion and modelling services for more than 300 different formats of files such as CAD, GIS, point cloud, XML, and other spatial data formats; there is no longer a need to own a large number of diverse and expensive licenses!
- Services and tools for data quality verification and reporting, including the following aspects:
  - completeness,
  - consistency,
  - continuity,
  - compliance with guidelines, including 2D / 3D spatial data,
- Implementation and consulting services.

4. MGGP capital group

The capital group's operations are focused on several distinct operating segments, sharing many product and market synergies between them. Thanks to their efficient use, it is possible to maximize the value of offered solutions.

In addition to MGGP S.A., the capital group comprises the following companies (subsidiaries):

MGGP Aero Sp. z o.o. – the company specialising in aerial photography and laser scanning as well as advanced spatial data processing technologies. With its fleet of four private aircraft, digital cameras, LIDAR laser scanning systems, MGGP Aero is able to deliver the most ambitious spatial data acquisition projects for investment in various fields of the economy.
Contact: contact@mggpaero.com, www.mggpaero.com

INIKO Sp. z o.o. – performs engineering consulting services for local government units and enterprises within water and sewage and municipal services management, as well as power industry.
Contact: iniko@iniko.pl, www.iniko.pl

MGGP Ukraine – offers geo-information services such as cadastre, geodesy, photogrammetry, and GIS. The company holds a license for conducting topographic and geodetic works issued by the State Committee of Ukraine for Land Resources. The company is based in Kiev.
Contact: contact@mggp.com.ua, www.mggp.com.ua

Ingeo Proiect Srl, Romania – offers geo-information services such as geodesy, cadastre, photogrammetry, and GIS. Ingeo Proiect is certified by the State Cadastral and Real Estate Agency (ANCPI) in Romania. The company is based in Bucharest.
Contact: office@ingeo.ro, www.ingeo.ro

5. Conclusions

MGGP S.A. is a company with annual revenue estimated at $ 15.3 million in 2016 ($ 22,3 million in revenues for the entire capital group). Employment is at the level of 260 people (in the capital group – 450). At present the company implements about 300 projects with varying budget sizes. The customers of these projects come from the public procurement market (51%), the commercial market (34%) and from abroad (15%).

The company has experience in managing projects in Poland, Central and Eastern Europe, North Africa and the Middle East. It has implemented projects in Romania, Ukraine, Germany, Turkey, Croatia, Latvia, the Netherlands, Libya, Lebanon and Saudi Arabia.

The quality management, environmental, occupational health and safety certifications possessed are the proof of the company's corporate social responsibility, and the guarantee that it is perceived as a reliable partner worthy of the highest trust. In recent years, MGGP S.A. has won a number of awards and distinctions in national competitions for projects and implementations of technical ventures.

MGGP S.A. is a reliable partner in many projects, and it has a highly qualified staff who are honest and dependable in approaching new challenges.

Keywords: engineering, architecture, geo-information

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Soil degradation by salinization

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Soil salinization processes

Salinization develops over time and space due to the gradual accumulation of soluble salts, whatever their nature, in soil or on the soil surface (saline crusts or efflorescences). Certain salts, in particular sodium salts, favour the dispersion of clay minerals, degrade soil structure and slow down water infiltration. The salinization and sodisation processes of soils are complex, occurring in all latitudes and climates. They are closely related to surface water and groundwater flow processes. Beyond a given threshold of soil salinization, plant growth, crop production, water and soil quality are severely affected, leading to soil erosion, land degradation and ecosystem desertification.

Natural saline environments, so-called „*primary*" salinization, present a wide variety of landscapes ranging from diffuse salinization to extreme salinization. Saline soils develop in relation to a remarkable biodiversity (halophytes), which offer resources available to local populations (saliculture, pastoralism). Many natural factors generate soluble salts on the planet Earth: weathering and dissolution of minerals contained in soils and rocks, geothermal sources, wind erosion, necrosis of living beings), transport them (rains, rivers, groundwater, seawater, winds) and accumulate them in soils (dry climates, temporary droughts, near the sea in coastal and deltaic zones, near a shallow saline water table, aeolian deposits (sea spray, aerosols), endoreic zones (sebkhas, chotts).

Human activities, which induce so-called „*secondary*" salinization, are numerous: irrigation misconduct, practices of old irrigation techniques, irrigation with waters rich in salts, intensive deforestation, fertilizers containing potassium and nitrogen salts, atmospheric deposition near industrial sites. Anthropogenic salinization increases natural salinization, changes the composition of natural waters (lakes, rivers, groundwater), degrades the quality of water required to satisfy do-

mestic, agricultural and industrial needs, contributes to soil biodiversity and soil fertility losses, modifies local climatic conditions, creates health issues, drastically reduces agricultural and fish farming activities.

Photo 1. Halophytic vegetation and pastoralism activity along the Kelbia sebkha (Central Tunisia)

Rehabilitation of saline soils

Soils in many countries are particularly affected by salinization due to the semi-arid to arid climate and the development of intensive irrigation for agriculture through the construction of numerous storage and distribution systems (dams, hillside dams, canals and water pipes). The consequences of climate change (reduced precipitation, increased freshwater evaporation and higher plant evapotranspiration rates) will result in a concentration of soluble salts within the water bodies and in the extension of soil salinization. The predicted sea-level rise by the Intergovernmental Panel on Climate Change scenarios will have an impact on coastal areas and wetlands (deltas of major rivers) and will promote the saline contamination of coastal aquifers due to underground seawater intrusions. The overexploitation of fragile freshwater layers on brackish aquifers will intensify, with increased need for agricultural, industrial and domestic activities which are mainly located along the coast.

As in the past, farmers know how to control and reduce soil salinization. They must combine key parameters including a good freshwater supply to dissolve salts,

a good soil structure to favor water infiltration and salt leaching, and a good drainage to evacuate the salts out of the root zone of the crops. The soil salinization extension due to climate change will be mitigated through adaptive measures including:

- the protection of coastal areas and lowlands (deltaic plains) from flooding (tidal waves) and seawater intrusion;
- the change of cropping patterns by promoting saline farming, salt-tolerant crops, and rainfed-irrigated systems;
- the increased incentives for water saving techniques improving the water quality (drip irrigation, seawater desalination);
- the effective overexploitation control of deep groundwater bodies.

The development of plants, under natural and agricultural conditions, is directly affected by the saline degradation of water and soil, especially in dry, arid and semi-arid regions. Remediation of saline soils is feasible through substantial financial investments, which mainly penalizes countries with limited incomes. The good conduct of irrigation and drainage techniques is a guarantee of success, but the poor quality of irrigation water is a brake on the sustainable development of irrigated areas. The local grouping of farmers in collective structures promotes the dissemination of technical knowledges and access to credit institutions.

Photo 2. Pomegranate plantation using drip irrigation on clayey and saline soils (Kairouan region, Central Tunisia)

Keywords: soil salinization processes, rehabilitation of saline soils, Tunisia

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Scholarship granted by the Foundation of Saint Casimir

Zygmunt L. Ostrowski

Foundation «Œuvre de Saint Casimir»,
119, rue du Chevaleret – 75013 Paris, France

The Saint Casimir Foundation, existing since 1846 in Paris, decided to award post-graduate scholarships in Paris to Polish postgraduate students, enabling them to acquire expertise in a given field. The eligible subjects include history, literature, political sciences, law (in particular international law), trade (within European Union), ecology, art, architecture, theology, and so forth

According to the current regulations in Poland, the 3rd (doctoral) cycle of studies is planned over three years, with the possibility to follow a part of these studies outside Poland. Candidates must choose a theme of the doctorate and be guided by a Thesis Supervisor in Poland.

Polish candidates can then follow a part of their doctoral research in Paris, with easy access to bibliographical sources, historic monuments, and so forth. They can follow specialized courses in French institutions (HEC, Camondo-decorative arts, School of Louvre, etc.).

By these scholarships, we hope to strengthen the links between our two countries: France and Poland in the framework of a better collaboration within the European Union.

The creation of St. Casimir Scholarship can be an example for other Polish organizations in the world, showing how we might help Polish students to find necessary scientific materials and strengthen relationships between the given country and Poland. In fact, the advantage is always double-sided: for Poland, this is another opportunity to develop international collaboration, and for the country receiving Polish students long term, there is a chance that they shall become this country's finest Ambassadors.

Keywords: scholarship, Foundation of Saint Casimir

Project title

"Crisis management in the Natura 2000 area under flood conditions, illustrated with an example of the Vistula River Gorge in Małopolska (km 254 + 000-307 + 000)"

Implementing institutions:
Hugo Kołłątaj University of Agriculture in Kraków
Institute of Nature Conservation, Polish Academy of Sciences in Kraków

Project co-financing: European Economic Area Financial Mechanism 2009–2014

Project Type: Competition (call for proposals). Conservation of biodiversity and ecosystems

Result of the Operational Program: Improvement of the management effectiveness and the monitoring of Natura 2000 sites

Total cost: 1 448 192 złoty

Overall objective of the project: increased effectiveness of the management and the monitoring of Natura 2000 sites.

Project results: improving the conservation status of the species covered by the Natura 2000 sites.

The project objective is to carry out monitoring of the most valuable species (little tern – *Sternula albifrons* – up to 85% of the population of this species occur in the middle of the Vistula River; and common tern – *Sterna hirundo* – 35%). Animal monitoring has covered their distribution and activity in the field (refuges, feeding grounds, breeding and nesting grounds, range of their daily activities). At the same time, the monitoring was carried out in relation to the functioning of the river environment: flood changes (islands, shallowings, oxbow lakes, changes in the morphology of river bed and valley, etc.) and threats to valuable species resulting from typical flood protection activities: embankments, changes in the currents and in the morphology of the channel). An assessment of the hydrological equilibrium

of the Vistula river was carried out, including longitudinal profile, horizontal section of the river channel, sediment transport, floodplain interaction, catastrophic flows and changes in the configuration of river bottom, island retention and the formation of oxbow lakes, as well as physicochemical properties of water. The direct result of collating spatial information ensuing from multidisciplinary research in the project is an indication of the location of particularly valuable natural and conservation sites, which, under the conditions of flood and associated flood risk, should remain preserved from significant changes.

The main project tasks include:

- evaluation of the horizontal and vertical arrangement, in order to determine the parameters of the hydrodynamic equilibrium and perform numerical modelling of hydraulic flow conditions,
- assessment of the ecological status of the Vistula river in the studied section,
- habitat modelling based on hydraulic conditions.

Main researchers, responsible for the implementation of the project: prof. dr hab. inż. Wojciech Bartnik, prof. dr hab. inż. Włodzimierz Popek, dr hab. inż. Włodzimierz Kanownik, dr hab. inż. Leszek Książek, dr hab. inż. Andrzej Strużyński, dr hab. Tadeusz Zając, prof. IOP, dr Wojciech Bielański, dr inż. Jacek Florek – Project Leader, dr inż. Tomasz Stachura, dr inż. Maciej Wyrębek, dr inż. Małgorzata Leja, dr inż. Agnieszka Woś, dr inż. Mateusz Strutyński, dr inż. Michał Nowak, dr Paweł Adamski, dr inż. Artur Klaczak, dr inż. Paweł Szczerbik, dr Kamil Szczepka, dr Katarzyna Zając, mgr Dorota Kwaśna, mgr Anna Lipińska, mgr Adam Ćmiel, mgr Małgorzata Łaciak

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Significance and future perspectives of aquatic microbial diversity in the reduction of, and adaptation to water related stress

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At present, water resources are fairly inadequate worldwide and attaining their highest conceivable use is not that easy. Aquatic ecosystems are now plagued by deterioration and the loss of microbial diversity that jeopardize food security, health, clean environment as well as sustainable economic development. They are largely characterized by high pressure, salinity, temperature, absence of light, etc. that interfere with their efficient use. Microbial biodiversity in aquatic ecosystems is an amazing resource near to us; it denotes our livelihood's insurance and represents a natural capital consolidating our sustainable development and economy. Microorganisms furnish aquatic habitats everywhere for all other living species, and they play a crucial role in the geo-biochemical. They also reduce and adapt water related stress. Microorganisms incorporate a wide-ranging and diverse gathering of living organisms, predominantly bacteria, fungi, algae and Actinomycetes. Some of them are halophiles that require an aquatic ecosystem with at least 12–15% NaCl salt saturation in order to survive and grow well. Microorganisms play a major role in transforming plant nutrients in the aquatic ecosystems through mineralization & immobilization, oxidation & reduction, solubilization etc. For instance, autotrophic microorganisms oxidize plant ammonia to nitrite (*Nitrosococcus* sp.) and nitrite to nitrate (*Nitrococcus* sp.); they convert sulphur compounds to forms readily available for other aquatic biodiversity adsorption. Heterotrophic microbes, on the other hand, degrade and decompose organic matter and some of them fix atmospheric nitrogen in aquatic ecosystems. They also serve as an important source of food for a variety of aquatic organisms. At the time being it is a must

to regulate and direct microbial activity in aquatic ecosystems, in order to combat water stress and furnish a healthy ecosystem, using the developed novel biotechnologies at our disposal.

During the last decades, most countries did not invest what was needed to reach sustainable management of aquatic ecosystems related to microbial diversity, through environmental conservation, economic feasibility and social equity. The main challenges and constrains confronting sustainable management of aquatic ecosystems now include: the lack of technical experience, feeble political drive for environmental issues, limited institutional mandate, restricted available budgets, lack of proper indicators for sustainable management, and absence of systematic means to allocate secure funding.

Capacity building for the sustainable management of aquatic ecosystems dictates setting system approaches of policies and technical sustainable strategies, a full understanding of systems' implications to avoid unintended consequences, an application of the current state of scientific knowledge to achieve both short-term continuity and long term ecological integrity, and a better understanding of the links between social, economic, and biophysical systems.

Keywords: deterioration and the loss of microbial diversity, sustainable economic development, long term ecological integrity

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Sustainable management of low quality water applied in farming

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It is quite obvious that management and reuse of low quality water is one of the challenges that Egypt will have to deal with in the coming decades and beyond, and one that had received considerable attention as an environmental issue at political, technical and research levels. Sustainable management of low quality water in combination with high-efficiency treatment for the purpose of reuse is the only way to coop this challenge. Such practical technology provides options and has a high potential for enabling low-cost decentralized solutions. Unfortunately, many farming plants in Egypt receive different kinds of low quality water, for instance industrial wastewater, which contains PTEs alongside other toxic organic matters such as dioxins and furans together with many pathogenic micro-organisms such as parasites, bacteria, fungi and viruses. If the raw sewage effluent is also used in irrigation without treatment – and this is the case in most of Egypt – then the agro-products and crops will be contaminated with the abovementioned hazardous materials. These contaminants enter the food chain resulting in several deleterious effects. Moreover, they may cause severe hematological and neurological ailments in adults, combined with cancer, hepatitis and kidneys and liver failure and other diseases.

In addition to that, it is worth mentioning that most of the sewage effluents are disposed raw in the canals and drains all over Egypt, and hence they reach the soil and cause severe adverse consequences.

The concept of the new point of view in the best management practices of contaminated soils irrigated with low quality water has been recently highlighted, and

it involves biochemical treatments with elemental natural products combined with bio-fortification with a set of certain varied micro-organisms that could be used for growing properly diversified harvests without risk.

The Egyptian perspective is seeking to apply the developed, novel biotechnologies that are able to remove different kinds of contaminants from soils irrigated with low quality water in some hot point farms varied in their ecosystems, in collaboration with the National and international Authorities.

Keywords: sustainable management, low quality water, biochemical treatments, Egypt

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Association of polish engineers and technicians in France Participation in the third "Ecology and Environmental Science" workshop

Lucjan Sobkowiak

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Association of polish engineers and technicians in France, in collaboration with PAN (Polish Academy of Sciences) in Paris and the IRD (*Institut de Recherche pour le Developpement*) in Paris-Bondy, France under the auspices of the Polish Embassy in Paris and the EFPSNT (European Federation of Polish Scientific and Technical Associations) organized the Second Workshop dedicated to "Ecology And Environmental Science" on 25 November 2015 at PAN in Paris and at IRD in Paris-Bondy, France.

The Third Workshop concerning "Ecology and Environmental Science – Reduction of Water Stress and Adaptation to Stress" will take place in Kraków on 9–10 June 2017, and is organized by the University of Agriculture in Kraków, Faculty of Environmental Engineering and Land Surveying, in collaboration with the Association of Polish Engineers and Technicians in France, PAN in Paris and IRD in Paris-Bondy, France under the auspices of: French Embassy in Poland, Urząd Marszałkowski Województwa Małopolskiego (Małopolska Regional Office), President de la Region Centre-Val de Loire à Orleans, France, the Rector of the University of Agriculture in Kraków, and the Polish Academy of Sciences in Warsaw.

The Third Workshop is organized as part of the 100th anniversary of the Association of Polish Engineers and Technicians in France. This Technical Association is the oldest association of the Polish diaspora throughout the World.

In the year 1917, one year before the end of the First World War, and one year before Poland recovered State independence and liberty, after almost 150 years of German, Russian and Austrian occupation, the Polish Engineers living and working in France decided to create The Association of Polish Technicians in France.

Their purpose was the preparation of Polish Engineers in France to rebuild and develop Polish industry after Poland would regain independence.

The first President of this Association, Mr. Joseph Lipkowski, president of his own company in France, decided in 1919 to go to Poland and participate in the development of military industry. In a short time, he became a General in the Polish Army.

From the time of the organization's creation – during the 100 years, in the interwar period, after the Second World War, in the time of cold-war, then at the time of "Solidarity" Revolution up to this day – the members of the Association of Polish Engineers and Technicians in France have been actively working in France, Great Britain, North and South America, South Africa, and Australia. They have participated in the development of High Technologies throughout the world. Before General Joseph Bem was involved in the advances of military technologies, Marie Curie-Skłodowska was responsible for ground-breaking developments in the atomic and chemical sciences, and Jan Czochralski created new material technologies. Jan Czochralski's discoveries were fundamental for the development of electronic technologies – he indeed paved the way to the Third and Fourth Industrial Revolution.

Perhaps these industrial revolutions bring more opportunities to develop also Ecology And Environmental Science, by using their inventions and patents.

I am very happy to have the privilege to present our 100-year-old Association of Polish Engineers and Technicians in France during this Third Workshop in Kraków, bringing together Environmental Scientists from France, Egypt, Tunisia and Poland.

The purpose of this Third Workshop is to continue the exchange of scientific and teaching experiences, and to help develop concrete scientific collaborative projects.

In the past, in their pursuit of easy business, humans created many environmental problems. Today we better understand that it is necessary to repair and protect our air, water and soil.

Today, paradoxically, we have the legislation for air and water protection, but there are no such regulations for soil protection. About 500 environmental organizations call on the European Commission to legislate more, concerning soil protection. International Day of the Soil -- celebrated since 1970 by the United States of America -- from 2009 is also registered in the UNO calendar on 22 April. The soil is a non-renewable resource, that is, a finite one, and it is degrading extremely fast.

In the conclusion of this Third Workshop, the Association of Polish Engineers and Technicians in France can be a platform to provide real and substantial Polish-French collaboration for young scientists and their research work.

The Baltic Sea is in a precarious situation, in terms of water pollution. It is possible that in the future, the Baltic could become dead, without flora or fauna. Perhaps Poland should organize a Workshop together with all countries neighbouring the Baltic Sea, concerning these environmental problems?

I would like to thank very much my Friend and also a member of the Association of Polish Engineers and Technicians in France, Dr Jerzy Niziński, for his involvement in the organization of this Third Workshop in collaboration with the Faculty of Environmental Engineering and Land Surveying at the University of Agriculture in Kraków.

Keywords: development of collaboration with Polish Associations in France, Europe and in World

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Małopolska Centre of Biotechnology – a new research unit at the Jagiellonian University

Kazimierz Strzałka

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Małopolska Centre of Biotechnology (MCB) of the Jagiellonian University was officially opened on 13th of May 2015, as a new research unit, functioning according to principles different than faculties and institutes. The basic difference is that scientists employed at the MCB do not have any teaching obligations, although they may teach voluntarily. Having no teaching obligations, they are expected to perform research at the highest possible level. MCB consist of 6 Departments (Bioinformatics, Bioremediation, Biotechnology and Food Safety, Genetic Research and Nutrigenomics, Neurobiology, Structural Biology) and 25 laboratories equipped with modern scientific instruments.

Apart from the high quality research, another principle of MCB is a strong international collaboration with leading scientific institutions. So far cooperation agreements have been signed with Max Planck Society, CNRS, Kyoto University and National Institute of Agrobiological Sciences in Tsukuba, Japan and respective laboratories either have been already created or they are in the course of formation. An important novelty is an "International Advisory Board" that will evaluate research groups at MCB and will actively create scientific policy of the Centre. The research carried out at the MCB is of both fundamental as well as applied nature. Apart from performing basic research, the mission of the Centre is to create innovations and transfer the know-how and new technologies from the academia to industry.

Keywords: international collaboration with leading scientific institutions, create innovations, transfer the know-how and new technologies from the academia to industry

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Scientific Center of the Polish Academy of Sciences

Marek Więckowski

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The Scientific Center in Paris is the oldest and most prestigious among the seven branches of the Polish Academy of Sciences abroad. The primary objective of the Scientific Center of the Polish Academy of Sciences in Paris is to promote Polish scientific activities in France. This includes initiating knowledge-based contacts between Polish and French research institutions (*Centre national de la recherche scientifique*, universities and colleges), co-organizing and supporting international research in science and technology. This is enhanced by organizing conferences, exhibitions and book promotions, disseminating Polish science and culture in Paris. One of the most important tasks of the Center also includes assisting scientists, PHD students, fellows from the Polish Academy of Sciences and Polish Universities and those arriving to France for research or educational purposes.

Since 1951 the Scientific Center has been a unit of the Polish Academy of Sciences. It is located in the 16th arrondissement of Paris and is composed of two buildings which contain a conference rooms, library, guest rooms, dining room and office desk. The guest rooms accommodate researchers and other PAS employees, scholarship holders, Polish higher education students, and students of other academic institutions, staying in Paris for scientific purposes. They may also host foreign scientists taking part in various events organized by the Center.

Every year the Center organizes approximately 50 scientific events and 6–8 exhibitions mostly connected to a conference. Annually, the most important conferences are Assises Franco-Polonaises (Polish-French Congresses) organized every year in different scientific disciplines, in 2014 on History, in 2015 on Chemistry, in 2016 on Geography, and this year on Mathematics and Mechanics. We organized a few special scientific events, e.g. *Soils indicators as a tool for environmental management* (on occasion of the International Year of Soils by UNESCO),

Poland on Maps – (on occasion of the International Year of Maps), and some biographic events on Józef Bem, Olga Boznańska, Cyprian Kamil Norwid and Henryk Sienkiewicz.

Such collaboration involves not just organizing events, but also maintaining a network based on research interests, as well as consulting and assisting researchers in establishing agreements between institutions. The Center collaborates with several Polish Institutions (e.g. Polish Embassy, Polish Library in Paris, Polish Institute) and Polish professional associations in France, including the Association of Polish Engineers in France, the Association of Physicians, and the Association of Architects. The important part of activities concerns cooperation and assistance to Institutes of the Polish Academy of Sciences and Polish Universities. There are possibilities of cross-sectoral cooperation (e.g. with the Faculty of Environmental Engineering and Geodesy at the University of Agriculture in Kraków) in order to improve the research and didactic base (e.g. exchange of students, scientists and senior researchers) and foster the application of the acquired knowledge for future research and development.

Keywords: promote Polish scientific activities in France, co-organizing and supporting international research in science and technology

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Variabilité climatique et impacts hydrologiques en Roumanie

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Dans le contexte où de l'échelle globale aux échelles régionales et locales le changement climatique et les impacts associés sont parmi les préoccupations majeures des scientifiques et décideurs de nous jours, ce travail a pour but de mettre en évidence des aspects synthétiques portant sur la variabilité des principaux paramètres climatiques et la réponse hydrologiques, en Roumanie. Dans une première partie, le travail présente une synthèse des résultats des études menées en Roumanie qui mettent en évidence les changements observés dans la variation des principaux paramètres climatiques contrôlant l'écoulement des rivières (température de l'air, précipitations, neige), après 1961, ainsi que les prévisions issues des modèles régionaux à l'échelle de l'Europe (du programme EuroCordex), pour la période 2021–2050. Dans la deuxième partie, le travail présente des aspects illustrant des changements dans la variabilité des débits liquides des rivières aussi sur l'ensemble de la Roumanie, qu'à l'échelle régionale et de quelques bassin-versants où nous avons fait des études de cas (changements qui ont été observés et simulés par modélisation hydrologiques).

L'analyse de la variabilité des paramètres climatiques observés illustre des tendances générales à la hausse de la température de l'air (notamment au printemps et en été) et de baisse pour l'épaisseur et la durée de la couche de neige. Quant aux précipitations, sur l'ensemble du pays, à l'échelle annuelle, il n'y a pas de tendance significative, à l'exception de l'automne où une tendance à la hausse a été identifiée. Pour le futur, le scenario RCP 8.5. montre comme changements significatifs des paramètres climatiques majeurs influençant le régime hydrologique, l'aug-

mentation de la température de l'air et la diminution de l'épaisseur de la couche de neige, avec des différences régionales à l'échelle du pays.

L'analyse de la variabilité hydrologique a été menée aussi bien pour l'ensemble de la Roumanie, que pour des bassins versants situés dans des régions géographiques différentes (montagneuse, de plateau et de plaine). Comme changements observés, pour l'ensemble du pays nous avons remarqué: une tendance générale à la hausse des débits, au printemps et en automne ; tendances positives pour les débits faibles et moyens et tendances négatives pour les hautes débits. A l'échelle des bassins versants analysés, on a identifié, généralement, une tendance à la hausse des débits maximums annuels et une fréquence plus élevée des grandes crues (avec le débit de pointe supérieur à la moyenne des débits maximums annuels). Les issues des modèles hydrologiques ont montré pour le futur, des changements majeurs dans le régime hydrologique des rivières analysées : le déplacement des hautes eaux du printemps vers l'hiver et une diminution importante des débits durant la saison chaude (mars – septembre) ; crues nivales plus précoces et diminution des crues mixtes de printemps ; accroissement de la fréquence des hauts débits au printemps (notamment en avril) et diminution en été (notamment en juin).

Mots clés: variabilité climatique, débits liquides, régime hydrologique, Roumanie

Historia Wydziału IŚiG

History of the Faculty of Environmental Engineering and Land Surveying

Faculty of Environmental Engineering and Land Surveying

Genesis of the Faculty

The origins of the Faculty of Environmental Engineering and Land Surveying of the University of Agriculture in Krakow date back to the 19th century. In 1890, Agricultural College was established at the Faculty of Philosophy of the Jagiellonian University. One of the seven units of the College was the Department of Agricultural Engineering.

The organiser and first Head of the Department of Agricultural Engineering at the Agricultural College was Prof. Kazimierz Ajdukiewicz, who managed the Department until 1899. He was followed by Prof. Tadeusz Sikorski, who held the position of Department Head until 1924. In the years 1914–1920, Prof. T. Sikorski was also Director of the College. After the Agricultural College was transformed into the Faculty of Agriculture of the Jagiellonian University (1923), Prof. T. Sikorski served the function of Deputy Dean for the Faculty in 1923–1924. The Department of Agricultural Engineering became one of the thirteen units of the new Faculty, and Adam Marian Różański, DSc, was appointed Head of the Department. He had extensive professional and organisational experience and was one of the most eminent specialists in the field of hydraulic engineering and land reclamation in Poland. In 1953, after the Academy of Agriculture in Krakow was founded, Prof. Dr. Eng. Franciszek Hendzel became Head of the Department of Agricultural Engineering at the Faculty of Agriculture therein.

In 1955, the Department provided a basis for creating the Faculty of Land Reclamation – the third of this kind in Poland and third in the Academy of Agriculture in Krakow. It was later transformed into the Faculty of Environmental Engineering and Land Surveying that we know today. Prof. Franciszek Hendzel, who was the first Dean of the Faculty of Land Reclamation, held this position until 1958.

History of the Faculty

In 2015, sixty years have passed since the establishment of the Faculty of Land Reclamation, which in 1960 was expanded by forming the Division of Land Surveying for Agricultural Management and operated in the structure of the Agricultural College, and from 1972 to 1992 – of the Academy of Agriculture. In 1992, the Faculty of Land Reclamation with the Division of Land Surveying for Agricultural Management changed its name to the Faculty of Environmental Engineering and Land Surveying of the Hugo Kołłątaj Academy of Agriculture in Krakow, and since 2008 – of the University of Agriculture in Krakow.

Prof. Dr. Eng. Franciszek Hendzel was the first Dean of the Faculty of Land Reclamation, and Associate Prof. Eng. Ignacy Rabczuk was the organiser of the Division of Land Surveying for Agricultural Management. At that time, there were forty-six people employed at the Faculty, working in fifteen Departments and two laboratories. In the academic year 1970/1971, three Institutes and two Departments were formed out of fifteen Departments. In 1981, the departmental structure was restored. As a result of these changes, three new Departments and twelve Units were established.

Between 1992, when the Faculty was renamed, and 2005, fourteen Departments and Units functioned within its structures. Over the last decade, the organisational structure of the Faculty underwent further changes. Currently, the Faculty consists of nine Departments, with a total of 129 academic teachers, including 14 professors, 23 associate professors, 91 doctors, and 1 master engineer. The Faculty infrastructure, initially very modest, improved radically after 1964, when the Faculty moved into a new building at Aleje Mickiewicza, where it still has its headquarters today. The infrastructural needs of the Faculty were fully met in 2009, with the construction of new educational facilities at Balicka street. Since the establishment of the Faculty and the Division, five-year uniform studies have been offered. In the academic year 1966/1967, two-stage studies were introduced: engineering and master's degree courses, which continued until 1974. In 1964, extramural master studies in land improvement were launched. In the academic year 1966/1967, four-year vocational engineering part-time studies in land reclamation were added, followed by courses in land surveying for agricultural management in 1969/1970. Organisational changes were accompanied by the changes in curricula. In 1974, the Faculty and Division reintroduced the uniform master's degree full-time courses with adequate programmes. Supplementary part-time studies were launched in 1975 at the Faculty, and in 1977 at the Division. In 1992, two fields of study were established: Environmental Engineering, and Land Surveying and Cartography, with new curricula implemented for both. Since the academic year 2001/02, studies continue in the ECTS system. In 2006, according to the Bologna Convention, a two-degree system of full-time and extramural studies was introduced. In two consecutive years, 2007 and 2008, the Faculty Board established further study majors: Spatial Management, and,

together with the Faculty of Horticulture, interfaculty studies in Landscape Architecture. The scope of the educational offer was further extended to include full-time studies in Engineering and Water Management, launched in the academic year 2012/2013. Since July 2014, the studies in Landscape Architecture have been offered solely by the Faculty of Environmental Engineering and Land Surveying. Currently, the Faculty educates students in five fields of study according to the curricula based on educational standards and the National Qualifications Framework (NQF). After completing the studies in the fields of Environmental Engineering, Engineering and Water Management, as well as Land Surveying and Cartography, there is a possibility to undertake doctoral studies and obtain a PhD degree.

Since 2011, the Faculty has had full academic authority in the field of agricultural sciences in the discipline of environmental protection and development, and since 2012, it has the power to confer doctoral degrees in the field of technical sciences in the discipline of geodesy and cartography. The scientific activity at the Faculty has a very broad interdisciplinary nature. The Faculty staff work together with numerous scientific institutions in Poland and abroad, while disseminating knowledge in collaboration with state administration bodies and construction companies.

Faculty Units

The Faculty of Environmental Engineering and Land Surveying of the University of Agriculture in Krakow consists of the following units:

- Department of Rural Building
- Department of Ecology, Climatology and Air Protection
- Department of Sanitary Engineering and Water Management
- Department of Hydraulic Engineering and Geotechnics
- Department of Land Reclamation and Environmental Development
- Department of Applied Mathematics
- Department of Land Surveying
- Department of Agricultural Land Surveying, Cadastre and Photogrammetry
- Department of Land Management and Landscape Architecture.

Fields of research

Scientific research at the Faculty of Environmental Engineering and Land Surveying of the University of Agriculture in Krakow is focused on the following core subjects:

- Improvements in rural construction
- Bedload and suspended load transport in river beds and mountain streams

- Discharge from river valleys and the restoration of flow capacity of watercourses
- Silting processes of small reservoirs
- Impact of the exploitation and development of small catchments on the quality of surface waters
- Hydrochemical conditions of the location of small retention reservoirs
- Improved principles of counter-erosion modelling of farmland layout
- Spatial and temporal diversification of meteorological conditions
- Reclamation and development of ecologically degraded areas
- Protection of peat bogs
- Rational development of water and sewage management in rural areas
- Efficiency of rural water supply and sewage systems
- Evaluation of the efficiency of different types of rural sewage plants
- Heavy metal contamination of soils and plants
- Recycling and waste minimisation
- Water and sewage management in agri-food industry plants
- Use of mineral soils and industrial waste for earth-engineering purposes
- Modernisation of land survey measurement technology
- Application of photogrammetry and remote sensing in the management of agricultural areas
- Visualisation of data in spatial planning
- Algebraic properties of the operators in Hilbert complex spaces
- Use of mathematical models in technical sciences.

Education at the Faculty

The Faculty of Environmental Engineering and Land Surveying of the University of Agriculture in Krakow has the authority to confer doctoral (PhD) and 'habilitated doctor' (DSc) degrees in the field of agricultural sciences in the discipline of environmental protection and development; doctoral degrees in the field of technical sciences in the discipline of geodesy and cartography; and also has the power to act for awarding the title of professor in the field of agricultural sciences.

The Faculty offers five courses of study, in the framework of which it educates students in eight specialties:

- Environmental Engineering
  - Sanitary Engineering
  - Rural Infrastructure
  - Environmental Engineering
- Engineering and Water Management
  - Water Management
  - Drainage Engineering
- Land Surveying and Cartography
  - Agricultural Land Surveying and Property Valuation

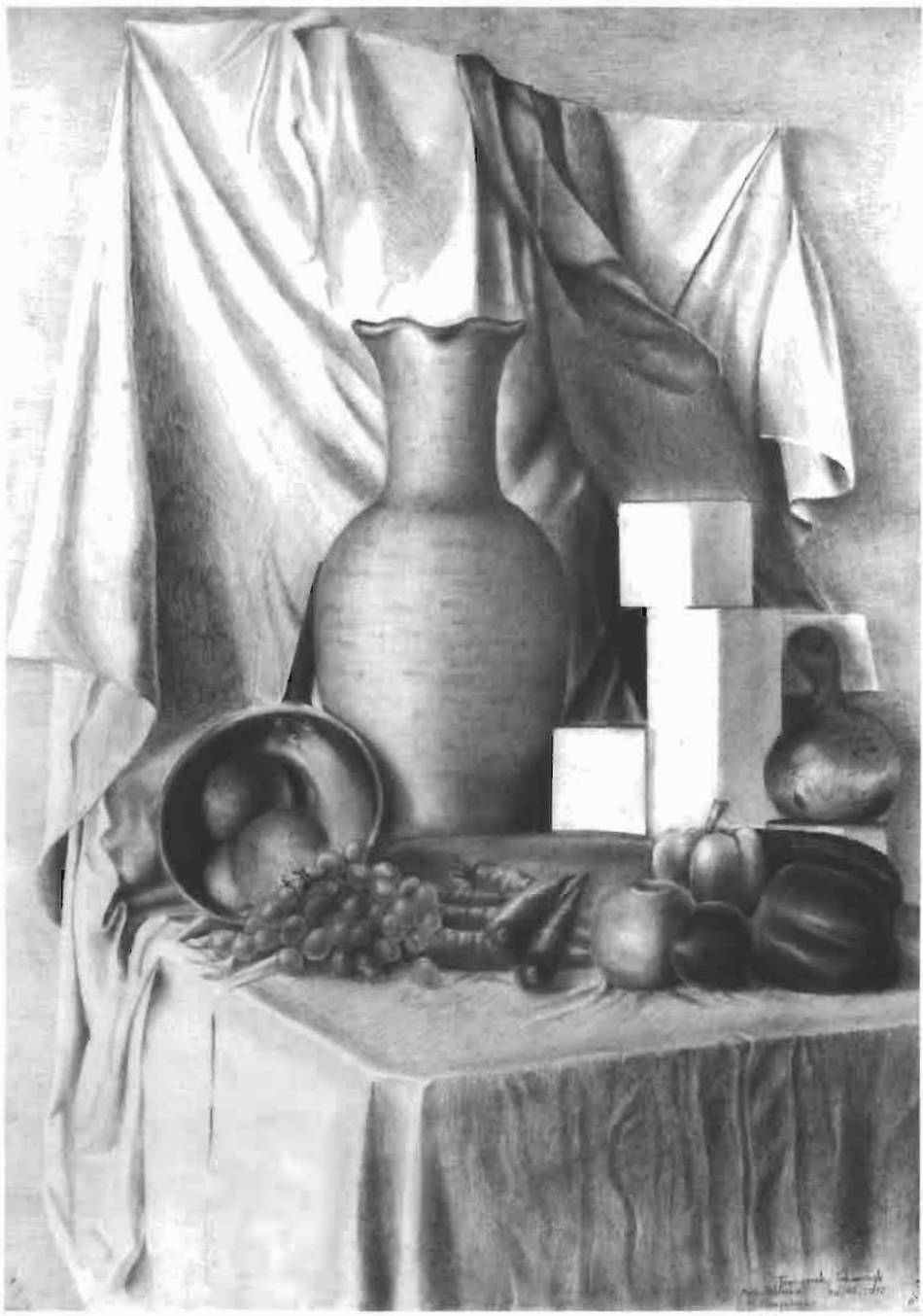
- Spatial Management
  - Regional Development
- Landscape Architecture

The two-degree educational offer is provided as both full-time and part-time extramural studies.

The Faculty is accredited by the National Accreditation Commission (2015). It is also a member of the European Federation of National Engineering Associations (FEANI), which means that education at the Faculty has been considered adequate to the standards of engineering studies in force in the countries of the European Union. Thus, the diplomas are internationally recognised, and they entitle the graduates to apply for the title of European Engineer (EUR ING). This allows our graduates to work in engineering professions in Western European states and several other countries.

Still Life
Author: Agata Skowron, Landscape Architecture
Work done under the direction of: Michał Uruszczak, PhD Eng. Arch.

Still Life
Author: Patrycja Witek-Wyrzykowska, Garden Art
Work done under the direction of: Michał Uruszczak, PhD Eng. Arch.



Still Life
Author: Franciszek Tokarczyk, Landscape Architecture
Work done under the direction of: Michał Uruszczak, PhD Eng. Arch.

Opisy Katedr

Descriptions of Departments

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(Prof. DSc Eng. ProfTit)

Academic staff

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Dr hab. inż. Piotr Bugajski (DSc Eng.)
Dr hab. inż. Krzysztof Chmielowski (DSc Eng.)
Dr hab. inż. Grzegorz Kaczor (DSc Eng.)
Dr hab. inż. Andrzej Wałęga (DSc Eng.)
Dr inż. Agnieszka Cupak (PhD Eng.)
Dr inż. Tomasz Kotowski (PhD Eng.)
Dr inż. Włodzimierz Miernik (PhD Eng.)
Dr inż. Agnieszka Operacz (PhD Eng.)

Non-academic staff

Dr inż. Ewa Wąsik (PhD Eng.)
Mgr inż. Jacek Czarnecki (MSc Eng.)
Mgr inż. Karolina Kurek (MSc Eng.)
Mgr inż. Barbara Mielenz (MSc Eng.)

PhD students

Mgr inż. Dariusz Młyński (MSc Eng.)
Mgr inż. Katarzyna Wachulec (MSc Eng.)
Mgr inż. Paulina Śliz (MSc Eng.)
Mgr inż. Karolina Kurek (MSc Eng.)
Mgr inż. Olga Woyciechowska (MSc Eng.)
Mgr inż. Błażej Stęplewski (MSc Eng.)

Research areas

- Analysis of the factors influencing water consumption and volume of wastewater discharged from rural households
- Feasibility of using storage and compensation tanks in the technology of purifying waters from rivers for water supply purposes
- Current conditions and possibilities for optimizing the operational situation of small waterworks
- Impact of wastewater temperature on the processes of their purification in small-scale sewage systems
- Analysis of various wastewater treatment technologies used in household water treatment plants in non-urbanized areas
- Semi-natural methods of wastewater treatment in rural areas
- Innovative solutions for the design and construction of sand filters in household sewage treatment plants
- Impact of infiltration waters and accidental waters on the functioning of small-scale sewage systems
- Use of small-scale water retention and infiltration for the management of rainwater runoff
- Analysis of the origins of the substances dissolved in water (isotopic analysis) and the determination of water age (analysis of noble gases)
- Groundwater hydrodynamics and circulation conditions in the active exchange zone in different aquifers
- Geogenic and anthropogenic processes that shape the chemical composition of groundwater, including the impact of microbial activity on the chemistry of these waters
- Conditions of outflow and water regime of the sources, and the expenditure from drilled wells in geologically diverse areas subjected to varied levels of anthropogenic pressures
- Identification of low flows in uncontrolled catchments, using regionalization
- Verification of the existing, and development of new methods for the calculation of inviolable and environmental flows in the basins of Upper Vistula river catchment area
- Modelling of hydrological processes in uncontrolled catchments of diversified management
- Verification of the usefulness of empirical methods for the determination of characteristic flows in uncontrolled catchments
- Impact of reservoir retention on the quantitative and qualitative development of water resources

External services provided

- Concept plans and designs for water and sewage systems
- Hydraulic analyses and reliability analyses of functioning water and sewage networks
- Aquatic legal surveys pertaining to water intake and discharge of purified wastewater to the receiving body of water
- Hydrogeological expert reports for the construction of household sewage treatment plants
- Household sewage treatment project designs
- Project designs for water supply and sewage systems for single family houses
- Assessment reports of the environmental impact of investment projects in the field of water and sewage management
- Analysis of hydrodynamic and hydrogeochemical conditions of various types of aquifers
- Hydrological expert reports and calculations in controlled and uncontrolled catchments, not cultivated anthropogenically as well as in urbanized catchments
- Concept plans of rainwater management solutions in urbanized areas
- Drawing up of water balance and water economy reports
- Qualitative assessment of water resources

Most important research projects

- N N305 073236, *Influence of accidental water on the operation of rural sewage treatment plants*, dr inż. Grzegorz Kaczor (PhD Eng.), 2009–2012, Ministry of Science and Higher Education
- N N523 411838, *Innovative solutions for the dimensioning and construction of vertical flow sand filters in household sewage treatment plants*, dr inż. Krzysztof Chmielowski (PhD Eng.), 2010–2013, Ministry of Science and Higher Education

Department of Agricultural Land Surveying, Cadastre and Photogrammetry

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dr hab. inż. Jarosław Janus (DSc Eng.)
dr hab. inż. Jacek M. Pijanowski (DSc Eng.)
dr inż. Stanisław Bacior (PhD Eng.)
dr inż. arch. Przemysław Baster (PhD Eng. of Architecture)
dr Agnieszka Bitner-Fiałkowska (PhD)
dr inż. Aneta Dacko (PhD Eng.)
dr inż. Jacek Gniadek (PhD Eng.)
dr inż. Bogusława Kwoczyńska (PhD Eng.)
dr inż. Bartosz Mitka (PhD Eng.)
dr inż. Renata Ostrowska (PhD Eng.)
dr inż. Izabela Piech (PhD Eng.)
dr inż. Magda Pluta (PhD Eng.)
dr inż. Robert Szewczyk (PhD Eng.)
dr inż. Jarosław Taszakowski (PhD Eng.)

Non-academic staff

dr inż. Bogdan Jankowicz (PhD Eng.)
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PhD students

mgr inż. Magdalena Badura (MSc Eng.)
mgr inż. Piotr Bożek (MSc Eng.)
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mgr inż. Halina Gołąb (MSc Eng.)
mgr inż. Alicja Jaksik (MSc Eng.)
mgr inż. Ewa John (MSc Eng.)
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mgr inż. Magdalena Łopacka (MSc Eng.)
mgr inż. Jerzy Nawrocki (MSc Eng.)
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mgr inż. Barbara Posiak (MSc Eng.)
dr inż. Roman Rybicki (PhD Eng.)
mgr inż. Edyta Sobaś (MSc Eng.)
mgr inż. Marek Szafarczyk (MSc Eng.)
mgr inż. Bogumiła Wańczyk (MSc Eng.)
mgr inż. Justyna Wróbel (MSc Eng.)
mgr inż. Jakub Żygawski (MSc Eng.)

Research areas

- Land Management
- Integrated rural development
- Technology and methodology for the implementation of complex consolidation works
- Information technology methods for supporting the implementation of farm and agricultural works
- Assessment of the impact of linear investment projects on the spatial structure of agricultural land
- Divisions and demarcation of real estate
- Data taxonomy related to the elements of rural technical infrastructure (technical utilities cadastre)
- GIS applications in the regional planning of utility and agricultural works
- Property valuation of agricultural and forestry land and real estate
- Spatial data visualizations of architectural objects based on ground photography and laser scanning
- Developing 3D models of cities
- Applications of state-of-the-art photogrammetric tools for generating DEM, DTM and orthophotomaps
- Remote sensing systems; imaging information systems; applications of remote sensing data in landscape monitoring
- Photogrammetric low-ceiling scanning approaches
- Design plans of urbanized areas and open landscape; design plans of housing estate areas
- Numerical interpretation of spatial synergy
- Valuation of landscape using the BTI method
- Landscape protection and preserving cultural heritage in terms of regionalism and cultural identity
- Spatial analysis in real estate valuation
- Morphological analysis of digital cadastral maps

External services provided

- Design concepts of spatial planning for municipalities, towns and housing estates
- Architectural and restoration projects
- Court expert opinions in the field of photogrammetry and geodesy

Most important research projects

- AZ 25007, *Realisierung eines stoffstromorientierten Abwasser- und Reststoffentsorgungskonzeptes in exponierter Lage unter Berücksichtigung objektspezifischer und ortsgebundener Randbedingungen, insbesondere des Umweltschutzes*, dr inż. Jacek M. Pijanowski (PhD Eng.), 2008–2011, Federal Environment Foundation of the Federal Republic of Germany (Deutsche Bundesstiftung Umwelt)
- 12 0101 06, *Development of an integrated system for the protection and shaping of agricultural and anthropogenic landscapes, using the example of selected southern Polish municipalities*, prof. dr hab. inż. Urszula Litwin (Prof. DSc Eng.), 2009–2011, Ministry of Science and Higher Education, National Centre for Research and Development
- 2CE164P3, *Valorisation and Sustainable Development of Cultural Landscapes using Innovative Participation and Visualisation Techniques*, dr inż. Jacek M. Pijanowski (PhD Eng.), 2010–2013, Central Europe

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dr hab. inż., prof. UR Volodymyr Hlotov (DSc Eng.)
dr inż. Klemens Godek (PhD Eng.)
dr inż. Paweł Kotlarz (PhD Eng.)
dr inż. Krystyna Michałowska (PhD Eng.)
dr inż. Monika Mika (PhD Eng.)
dr inż. Monika Siejka (PhD Eng.)
dr inż. Zbigniew Siejka (PhD Eng.)
dr inż. Marek Ślusarski (PhD Eng.)
dr inż. Dorota Świątoniowska (PhD Eng.)
dr inż. Agnieszka Wnęk (PhD Eng.)
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mgr inż. Agnieszka Szeptalin (MSc Eng.)
Piotr Samek

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mgr inż. Mariusz Górak (MSc Eng.)
mgr inż. Magdalena Jurkiewicz (MSc Eng.)
mgr inż. Przemysław Klapa (MSc Eng.)
mgr inż. Dawid Kudas (MSc Eng.)
mgr inż. Szymon Pudełko (MSc Eng.)
mgr inż. Damian Tokarczyk (MSc Eng.)

General scope of research

- Practical application of satellite geodesy, space geodesy, cartography, engineering geodesy, and real estate valuation (contemporary geodesy)
- Applications of information technology methods in geodesy (geoinformatics)
- Field information systems (data collection and data sharing methods)
- Adjustment computations (numerical development of geodetic survey results)
- Interdisciplinary research projects (geomatics, satellite geodesy, thematic and computer cartography)

Research areas and topics

Integrated geodetic techniques, numerical development of the results:

- Latest concepts for the numerical development of geodesic survey results (e.g. for integrated measurements)
- Integrated measurement technologies composed of classical and satellite methods
- Integration of contemporary measurement systems for engineering measurements in areas with varying degrees of inclination and a variety of surfaces and covers
- Kinetic modular networks for the integration with GPS measurements
- Application of 3D modelling and technologies in engineering geodesy and universal taxation
- Application of the ASG-EUPOS system for the implementation of contemporary tasks of engineering geodesy
- Application of the GNSS satellite systems for the installation of high-precision geodetic control networks
- Developing simple, universal methods for detecting fatigue errors and eliminating them from the calculation process
- Methods for the approximation of axes of modernized communication routes
- Geodetic surveys of watercourses and rivers; conducting geodetic work in protected areas

Physical geodesy:

- Studying and modelling of world ocean level changes, based on time-frequency methods
- Modelling of the motion of the Earth's centroid
- Forecasting of changes in the Earth's rotation parameters
- Application of satellite data for gravimetric satellite missions to test ocean water levels

Surface deformation monitoring:

- Methods for forecasting deformations in mining areas
- Application of contemporary measurement techniques in the monitoring of land surface and of objects exposed to deformation and displacement

- Analysis of the impact of underground mining on the geometry of objects in Land and Buildings Records in the aspect of updating the cadastral data

Laser scanning:

- Application of laser scanning in the creation and visualization of DTMs
- Terrestrial, mobile and aerial laser scanning and its applications in generating geospatial information
- Ground laser scanning as applied in engineering geodesy

Numeric maps and databases:

- Geometric algorithms and their applications in the field of geodesy and digital cartography
- Modernization of Land and Buildings Records' maps using the IT systems
- Using GNSS measurement techniques and GIS tools to create thematic maps
- Research on the attributes of topological accuracy of the numerical map
- Developing interactive maps for selected regions of Poland using alternative GIS tools
- Developing technologies for improving Land and Buildings Records' spatial databases
- Technologies for creating geospatial databases for geoinformation systems

Land surveys, cadastre and real estate valuation:

- Land and Buildings Records System in Poland – analysis of the existing situation in the aspect of the flow of information on the land and the creation of real estate cadastre
- Modernization of the real estate cadastre
- Multidimensional real estate cadastre – needs and possibilities of its implementation in Poland
- Model of a contemporary multidimensional real estate cadastre
- Application of state-of-the-art analytical methods in real estate valuation
- Application of multi-criteria methods for real estate market analysis
- Optimization of selecting the location for supra-local investments

Most important research projects

- N N526 2094 33, *Kinetic model of modular network integrated with GPS vectors for displacement determination*, dr inż. Tadeusz Gargula (PhD Eng.), 2007–2009, Committee for Scientific Research
- 2013/09/N /ST10/00664, *Investigation of the geophysical causes for the changes in coordinates of the Earth's centroid and the altimetric changes in ocean levels*, mgr inż. Agnieszka Wnęk (MSc Eng.), 2014–2016, National Science Centre

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dr hab. inż. Agnieszka Policht-Latawiec (DSc Eng.)
dr hab. inż. Marek Ryczek (DSc Eng.)
dr inż. Łukasz Borek (PhD Eng.)
dr inż. Grażyna Gawrońska (PhD Eng.)
dr inż. Sławomir Klatka (PhD Eng.)
dr inż. Edyta Kruk (PhD Eng.)
dr inż. Magdalena Malec (PhD Eng.)
dr inż. Adam Rużyczka (PhD Eng.)
dr inż. Tomasz Stachura (PhD Eng.)
dr inż. Ewelina Zając (PhD Eng.)
dr inż. Wioletta Żarnowiec (PhD Eng.)

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mgr inż. Barbara Franik (MSc Eng.)
Ryszard Franik
mgr inż. Małgorzata Starowicz (MSc Eng.)
inż. Marek Turschmid (BEng.)
mgr inż. Ewa Zagrodzka (MSc Eng.)

PhD students

mgr inż. Angelika Brodzińska Cygan (MSc Eng.)
mgr Wiktor Halecki (MSc)
mgr inż. Piotr Petryk (MSc Eng.)
mgr inż. Magdalena Wiśnios (MSc Eng.)
mgr inż. Anna Wota (MSc Eng.)

Research areas

- Comprehensive planning and development of catchment areas in mountain and submontane areas, including the erosion-preventive development of agricultural production areas
- Biotechnical development of rivers and streams
- Hydrological and hydrochemical regimes of small catchments in mountain and submontane areas subjected to various forms of anthropogenic pressure
- Concentrations and loads of chemical component inputs from precipitation and outflows from small agricultural catchments
- Application of geosynthetics in environmental engineering
- Soil valorisation and recultivation of degraded land
- Reclamation and management of industrial waste
- Development of areas and sites under environmental threats
- Forms of small-scale retention and importance thereof in the management of water resources
- Application of natural methods in environmental engineering
- Protection and rehabilitation of peatlands
- Economic and natural functions of wetlands and their importance in the landscape

Statutory research

"Hydrological, hydrochemical, natural and spatial determinants of the protection and development of natural environment"

Research by Young Scientists and Doctoral Students (BM)

1. Quality, utilitarian properties and the dynamics of changes in physicochemical parameters of waters entering and leaving the Skrzyszów reservoir
2. Seasonal variations in the content and loads of nitrates and phosphates in the Smugawka stream in Beskid Wyspowy range (Western Carpathians)

External services provided

- Seminars and lectures for state and local government employees on the methods of environmental protection and development in rural areas
- Consultations, expert reports and studies in the field rural areas development
- Assessment of the efficiency and effectiveness of the operation of water and drainage infrastructure
- Studies on the protection of soils against water erosion – both surface and linear
- Developing concepts for the regulation of air-water relations in soil
- Forecasting the impact of land use plans on the natural environment

- Determination of physicochemical characteristics of surface water and groundwater
- Evaluation of the effectiveness of geosynthetics in hydrotechnical engineering
- Assessment of the usefulness of earth masses for the reclamation of biologically degraded areas
- Development of scientific and technical recommendations and reports for the valorisation of degraded areas
- Determination of physico-aquatic and chemical properties of mineral and organic soils
- Determination of chemical composition of plant and geobotanic peat
- Outflow forecasts for peat deposits in the body of artificially designed water basins and reservoirs

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Head of the Department

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Academic staff

prof. dr hab. inż. Wacław Bieda (Prof. DSc Eng.)
dr hab. inż. Jan Radoń, prof. UR (DSc Eng.)
dr hab. inż. arch. Piotr Herbut (DSc Eng. of Architecture)
dr inż. Aleksandra Gryc (PhD Eng.)
dr inż. arch. Wiesław Kowalski (PhD Eng. of Architecture)
dr inż. Elżbieta Młynarczyk (PhD Eng.)
dr inż. Agnieszka Sadłowska-Sałęga (PhD Eng.)
mgr inż. Sabina Angrecka (MSc Eng.)

Non-academic staff

mgr inż. Paweł Sokołowski (MSc Eng.)
inż. Jarowit Szumski (BEng.)

PhD students

mgr inż. Wojciech Winiarski (MSc Eng.)

Research areas

- Rationalization of energy efficiency in the construction industry
- Use of renewable energy sources
- Heat exchange with soil in the environment of buildings

- Shaping the microclimate within buildings
- Mathematical models and computational analysis of thermal and humidity related phenomena in building partitions

External services provided

- Analysis of thermal and humidity related phenomena in building partitions
- Technical and economical analysis of the thermo-modernization of buildings
- Development of concept plans and projects in the area of construction, as well as material solutions and sanitary installations
- Technical consultations on functional-spatial project solutions, the use of renewable energy, and the use of the WUFI software
- Improvement of thermal and humidity comfort in residential, agricultural and historic buildings
- Rationalization of energy management in agricultural buildings, using renewable energy sources, the heat accumulated in the ground, and the recovery of heat from ventilation systems
- Optimization of thermal conditions in broiler chickens husbandry on deep litter
- Optimization of ventilation systems in livestock buildings
- Improving resting comfort for dairy cows

Most important research projects

- N N313 274439, *Impact of intermittent basement heating mode on the formation of heat flow in the ground and the surface temperature of the partitions*, dr hab. inż. Jan Radoń, prof. UR (Prof. DSc Eng.), 2010–2011, Ministry of Science and Higher Education
- N N311 401639, *The influence of natural ventilation on the microclimate and productivity of dairy cows in the modernized "Fermbet" type barn during the summer*, dr hab. inż. arch. Piotr Herbut (DSc Eng. of Architecture), 2010–2012, Ministry of Science and Higher Education
- 2011/01/N/ST8/02534, *Capacities and Limitations of the Computations of Hygro-humidity Conditions in Historical Buildings*, dr inż. Agnieszka Sadłowska-Sałęga (PhD Eng.), 2011–2014, National Science Centre

Department of Land Management and Landscape Architecture

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Academic staff

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dr hab. inż. Józef Hernik (DSc Eng.)
dr inż. Barbara Czesak (PhD Eng.)
dr Julia Gorzelany (PhD)
dr inż. Karol Król (PhD Eng.)
dr inż. Barbara Prus (PhD Eng.)
dr inż. Renata Różycka – Czas (PhD Eng.)
dr inż. Tomasz Salata (PhD Eng.)
dr inż. arch. Michał Uruszczak (PhD Eng. of Architecture)
dr inż. arch. Małgorzata Wilczkiewicz (PhD Eng. of Architecture)
dr inż. arch. kraj. Magdalena Wilkosz -Mamcarczyk (PhD Eng. of Landscape Architecture)

Non-academic staff

Anna Sieprawska
Elżbieta Warchoł

PhD students

mgr inż. Katarzyna Cegielska (MSc Eng.)
mgr inż. Anita Kukulska (MSc Eng.)
mgr inż. Maria Nawieśniak (MSc Eng.)
mgr inż. Tomasz Noszczyk (MSc Eng.)
mgr inż. Maria Pazdan (MSc Eng.)
mgr inż. Marta Szylar (MSc Eng.)

Research areas

- Spatial planning and organization of rural areas
- Spatial information systems
- Databases for spatial planning
- Thematic cartography
- Economic and social determinants of spatial planning
- Valuation of land and rural space for the purpose of spatial development
- Environmental land classification for the purpose of spatial planning
- Real estate management
- Landscape architecture and the protection and shaping of cultural landscapes

External services provided

- Assessment of physiographic, socio-economic and cultural conditions of spatial development of municipalities
- Valuation of rural space for planning and spatial planning purposes
- Developing a register of heritage monuments in the municipality together with the inventory of cultural and sacred objects
- Inventory of buildings and structures, approaches and road objects, water and sewage fittings, ditches and culverts, as well as visual assessment of buildings in terms of their aesthetic qualities
- Training of municipal office staff in the field of GIS system applications
- Spatial planning concept plans and projects for selected areas of municipalities

Most important research projects

- "Trans-European Education for Landscape Architects" Erasmus+ EU Program, Lead Partner: Vilnus Gediminas Technical University (Lithuania), 2016–2018.
- "Baltic Land Development Network", Lead Partner: Royal Institute of Technology — KTH Stockholm (Sweden), 2015–2016.
- "Impact of political and economic transition on land use changes in the Czech Republic and Poland: identification of key factors and processes", 2014–2015.
- "Comparison of Cultural Landscapes against the Background of Urbanization in China and Poland", Partners: University of Agriculture in Kraków and Beijing University of Agriculture, 2012–2014.
- "Independent Quality Assurance model for degree programmes in Russia" – EU Tempus Program, Lead Partner: Moscow State University of Geodesy and Cartography (Russia), 2012–2016.

- "Development of New Land Governance Studies in Macedonia and Ukraine" – EU Tempus Program, Lead Partner: Royal Institute of Technology – KTH Stockholm (Sweden), 2010–2013.
- "Protection of historical cultural landscapes to strengthen regional identities and local economies" – Cultural Landscape – EU Interreg IIIB Cadses Program, Lead Partner: University of Agriculture in Kraków, 2006–2009.
- "Cultural Landscapes of mountain and highland river valleys" – Polish-Norwegian Research Fund, Lead Partner: University of Agriculture in Kraków, 2009–2010.

Department of Ecology, Climatology and Air Protection

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Head of the Department

dr hab. inż. Agnieszka Ziernicka-Wojtaszek (DSc Eng.)

Academic staff

prof. dr hab. inż. Janusz Miczyński
prof. dr hab. inż. Andrzej Misztal (Prof. DSc Eng.)
dr hab. Tadeusz Zawora, prof. UR
dr hab. inż. Jan Zarzycki, prof. UR (DSc Eng.)
dr inż. Dawid Bedla (PhD Eng.)
dr Renata Kędzior (PhD)
dr inż. Jan Kołodziej (PhD Eng.)
dr inż. Paweł Mundała (PhD Eng.)
dr inż. Artur Szwalec (PhD Eng.)
dr inż. Jakub Wojkowski (PhD Eng.)
dr inż. Zbigniew Zuśka (PhD Eng.)

Non-academic staff

dr inż. Barbara Skowera (PhD Eng.)
mgr inż. Dawid Hyży (MSc Eng.)
mgr inż. Maria Klimek (MSc Eng.)
inż. Marek Telk (BEng)

PhD students

mgr inż. Kamila Dedio (MSc Eng.)
mgr inż. Joanna Krużel (MSc Eng.)
mgr inż. Agnieszka Lasota (MSc Eng.)

Research areas

- Assessment of changes in natural and anthropogenic ecosystems
- Transformation of vegetation in green spaces caused by various ways of their utilization or exclusion from use
- Management of environmentally degraded and threatened areas
- Heavy metal content in food chains in areas with varying degrees of pollution
- The impact of dam reservoirs on the changes in plant cover and the use of adjacent areas
- The occurrence and role of ecological grasslands in the natural environment
- Assessment of the ecological status of rivers and reservoirs
- Assessment of weather resources, values and threats to the environment for the purpose of shaping and protecting the natural environment in Poland, with particular regard to the Carpathians
- The impact of weather and climate on agrotechnical activities, yielding and water needs of crops
- Meteorological phenomena of extreme nature, and those detrimental to agriculture
- Polish agricultural and climatic regions in the light of contemporary climate change
- Evolution of Poland's climate in the context of global warming
- Environmental and economic effects of the contemporary climate change
- Topo-climatology
- Modelling of the natural phenomena, elements and processes
- Research on the microclimate of the interior of historic buildings in the aspect of threats resulting from the variability of external climate conditions
- Variability of atmospheric pollutants depending on climatic factors and topography, especially in mountain areas and in recreational and spa resorts; development of models for high concentrations
- An assessment of the impact of the change of energy carrier on the improvement of air pollution status and spatial location solutions
- Optimal spatial planning based on the measurements and studies in the field of spatial distribution of air pollution

External services provided

- Inventorying and valorisation of plant and flora communities
- Assessment of heavy metal content in vegetation (plant food) and development of healthy dietary recommendations, as well as the elimination of heavy metal contaminants from food and feed
- Identification of opportunities for the development of organic farms in the given municipality
- Comprehensive assessment of the potential for reclamation efforts in post-industrial areas

- Determination of the content of metals, assimilable forms of nutrients, organic matter, as well as reaction and conductance in elements of the natural environment.
- Conducting training, consultancy and advisory services on agricultural aspects of contemporary climate change and on the climatic determinants of agricultural production
- Analysis of the causes and effects of the occurrence of climatic events that are harmful to agriculture
- Quantitative determination of thermal and precipitation changes of climate indicators in the process of global warming, and their consequences for agriculture and water management
- Compiling reports on the characteristics of local climatic conditions in terms of valorisation of the natural and tourist attractiveness of the given municipality
- Drawing up reports on the characteristics of bioclimatic conditions in order to determine opportunities for tourism and sports in the given municipality
- Studies of the microclimate in the interiors of historical, sacred and museum objects
- Description of the characteristics of local climatic conditions for spatial planning purposes
- Estimating wind and solar energy resources, in order to assess feasibility and profitability of the planned investment project. Analysis of wind and insolation conditions based on measurement data and numerical modelling
- Inventory of emission sources and estimated emission of air pollutants in municipalities
- Assessment of air pollution status for spatial planning purposes

Most important research projects

- N306 044 32/3178, *Contemporary changes in the natural environment under different topo-climatic conditions of the Kraków Upland illustrated with the example of the Ojcowski National Park*, prof. Dr hab. Tadeusz Niedźwiedź (Prof. DSc Eng.), 2007–2010, Ministry of Science and Higher Education
- N N305 163939, *Impact of adjacent areas on the water quality in ponds*, prof. Dr hab. Eng. Andrzej Misztal (Prof. DSc Eng.), 2010–2012, Ministry of Science and Higher Education

Department of Applied Mathematics

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Head of the Department

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dr hab. Prykarpatskky Yarema (DSc)
dr Beberok Tomasz (PhD)
dr Budzyński Piotr (PhD)
dr Burdak Zbigniew (PhD)
dr Dymek Piotr (PhD)
dr Gierzkiewicz-Pieniążek Anna (PhD)
dr Kliś-Garlicka Kamila (PhD)
dr Kopcińska Joanna (PhD)
dr Młocek Wojciech (PhD)
dr Piwowarczyk Kamila (PhD)
dr Płaneta Artur (PhD)
dr Rutkowska Agnieszka (PhD)
dr Szancer Zuzanna (PhD)

Non-academic staff

mgr Majcherczyk Marta (MA)

Research areas

- Reflexivity and hyper-reflexivity of different operator classes, including Toeplitz operators in Hardy spaces on the unit circle, and in Hardy spaces in different areas on the complex plane, cut-off Toeplitz operators, powered partial isometry (congruence mapping)

- Structure of the pre-annihilator to different spaces in Hilbert complex spaces
- Properties of shifts weighed on l^2 type spaces defined on directed trees, with particular regard to their subnormality and composition operators
- Searching for models of isometric pairs, particularly compatible isometric alternates
- Investigation of the integrability of dynamic systems on manifolds
- Studies of the affine hyperplanes with induced structures
- Studies of the representation of operator in the solutions of hydrodynamic equations
- Flows in the rivers in the catchment area of the Upper Vistula river and their time series
- Determining the maximum probable flows using various statistical methods
- Analysis of stationary and oscillatory behaviour of high quantiles for flows in rivers
- Application of mathematical analysis methods in geodesy
- Trends in thermal changes of seasons

Research projects

- G-1519/KZM /02-06, *Reflective and hyper-reflective subspaces*, prof. Dr hab. Marek Ptak (Prof. DSc Eng.), 2004–2007, Scientific Research Committee
- G-1819/KZM/11-14, *Subnormality and reflexivity of certain classes of unrestricted operators in Hilbert spaces*, Dr. Piotr Budzyński (PhD), 2011–2014, National Science Centre

Department of Hydraulic Engineering and Geotechnics

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Head of the Department

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prof. dr hab. inż. Bogusław Michalec (Prof. DSc Eng.)
dr hab. inż. Eugeniusz Zawisza, prof. UR (Prof. DSc Eng.)
prof. dr hab. inż. Wojciech Bartnik, emer. (Prof. emeritus DSc Eng.)
dr hab. inż. Andrzej Strużyński (DSc Eng.)
dr hab. inż. Marek Tarnawski (DSc Eng.)
dr inż. Przemysław Baran (PhD Eng.)
dr inż. Mariusz Cholewa (PhD Eng.)
dr inż. Jacek Florek (PhD Eng.)
dr inż. Andrzej Gruchot (PhD Eng.)
dr inż. Katarzyna Kamińska (PhD Eng.)
dr inż. Karolina Koś (PhD Eng.)
dr inż. Karol Plesiński (PhD Eng.)
dr inż. Mateusz Strutyński (PhD Eng.)
dr inż. Maciej Wyrębek (PhD Eng.)
dr inż. Tymoteusz Zydroń (PhD Eng.)
dr inż. Agnieszka Woś (PhD Eng.)

Non-academic staff

mgr inż. Ewa Bielecka (MSc Eng.)
mgr inż. Bożena Flaga (MSc Eng.)
mgr inż. Wojciech Rosiak (MSc Eng.)
inż. Fryderyk Skalicz (BEng.)
dr inż. Joanna Stabryła (PhD Eng.)

PhD students

mgr inż. Wiktoria Czech (MSc Eng.)
mgr inż. Tomasz Koniarz (MSc Eng.)
mgr inż. Agata Majerczyk (MSc Eng.)

Research areas

- Hydrodynamic equilibrium and the stability of the bottom of rivers and streams
- Application of biological passages in hydrotechnical structures for the restoration of diadromous fish species
- Laboratory research and numerical modelling of hydraulic flow conditions in ecological passages for fish
- Assessment of hydrodynamic conditions of the watercourse in the riverbed with oversized grains
- Application of one, two, and three-dimensional numerical models for calculating the dynamics of water flow
- Restoring the patency of ecological river corridors
- Stability of the watercourse bottom (riverbed), by means of monitoring the river bottom fauna
- Assessment of the potential use of bottom sediments for agricultural purposes
- Assessment of the balance and sustainability of rivers and mountain streams, based on natural morphological conditions
- Application of mineral soils as construction material for building purposes, or as a foundation for construction
- Abrasion of the banks of mountain lakes (reservoirs), taking into account geological and geotechnical conditions, inclination of slopes and fluctuation frequencies of water levels in the reservoir
- Geotechnical aspects of the use of bottom deposits from dam lakes (reservoirs) for the construction of earthen structures; determination of suitability of deposits as construction material for the construction of communication or hydraulic embankments or for forming sealing layers in waste landfills
- Utilization of industrial waste – coal-based waste from underground coal mining, power plant ash and metallurgical slags in civil engineering
- Surface mass movements in the Western Flysch of the Carpathians in the light of slope stability studies based on field testing as well as analytical and numerical methods
- Geotechnical aspects of the protection against harmful environmental effects of municipal waste landfills
- Protection of areas adjacent to roads against the adverse impact of noise, by means of analysing the effectiveness of acoustic screens

External services provided

- Identifying the causes of floods, setting out hazard zones and analysing investment programs in order to increase flood security
- Flood risk management in order to raise public awareness of vulnerability to extreme and emergency threats

- Assessment of transport intensity of bed load and lifted rubble
- Field measurements and numerical modelling of water flow conditions
- Measurements of transport intensity of bed load
- Determination of river valley throughput and restoring connectivity
- Improving river basins in order to restore historical migration routes and to restore spawning grounds of diadromous fish species
- Renaturisation of rivers
- Siltation forecasts of water reservoirs
- Concepts for the construction of water structures, small hydropower plants and fish migration facilities
- Influence of natural conditions on the hydraulics of open channels
- Monitoring of the fish migration equipment
- Assessment of habitat conditions for fish from the point of view of the hydraulics

Research work, scientific and technical expert reports as well as consultancy and geotechnical supervision in the field of:

- examination of the subsoil for the purpose of the foundation of buildings of general construction, as well as communication and hydrotechnical infrastructure
- assessing the suitability of ground reserves for the construction of all types of embankments in water and land engineering
- assessment of the technical condition of hydraulic and communication embankments
- geotechnical aspects of the construction and technical reclamation of municipal and industrial landfills (including assessment of soil suitability for sealing and filtration layers, geotextiles and the conditions for their use)
- construction drainage: for residential and commercial buildings, roads and road-related infrastructure facilities, for instance underground passageways
- stability of slopes and embankments
- use of industrial waste and their mixtures in the construction industry (road embankments, railways, hydrotechnical embankments)
- construction of retaining walls using the technology of reinforced soil (use of industrial waste, various types of reinforcements, including geogrid)
- assessment of frost resistance of land for road and foundation purposes
- abrasion studies of the shores of mountain reservoirs (artificial lakes)
- investigation of geotechnical properties of bottom sediments in water bodies, for the purpose of civil engineering construction

Training of engineering and technical staff and providing consultancy on:

- the study of basic geotechnical parameters of land and industrial waste, in order to determine, among others, their usefulness for the construction of road embankments, flood embankments, earthen dams

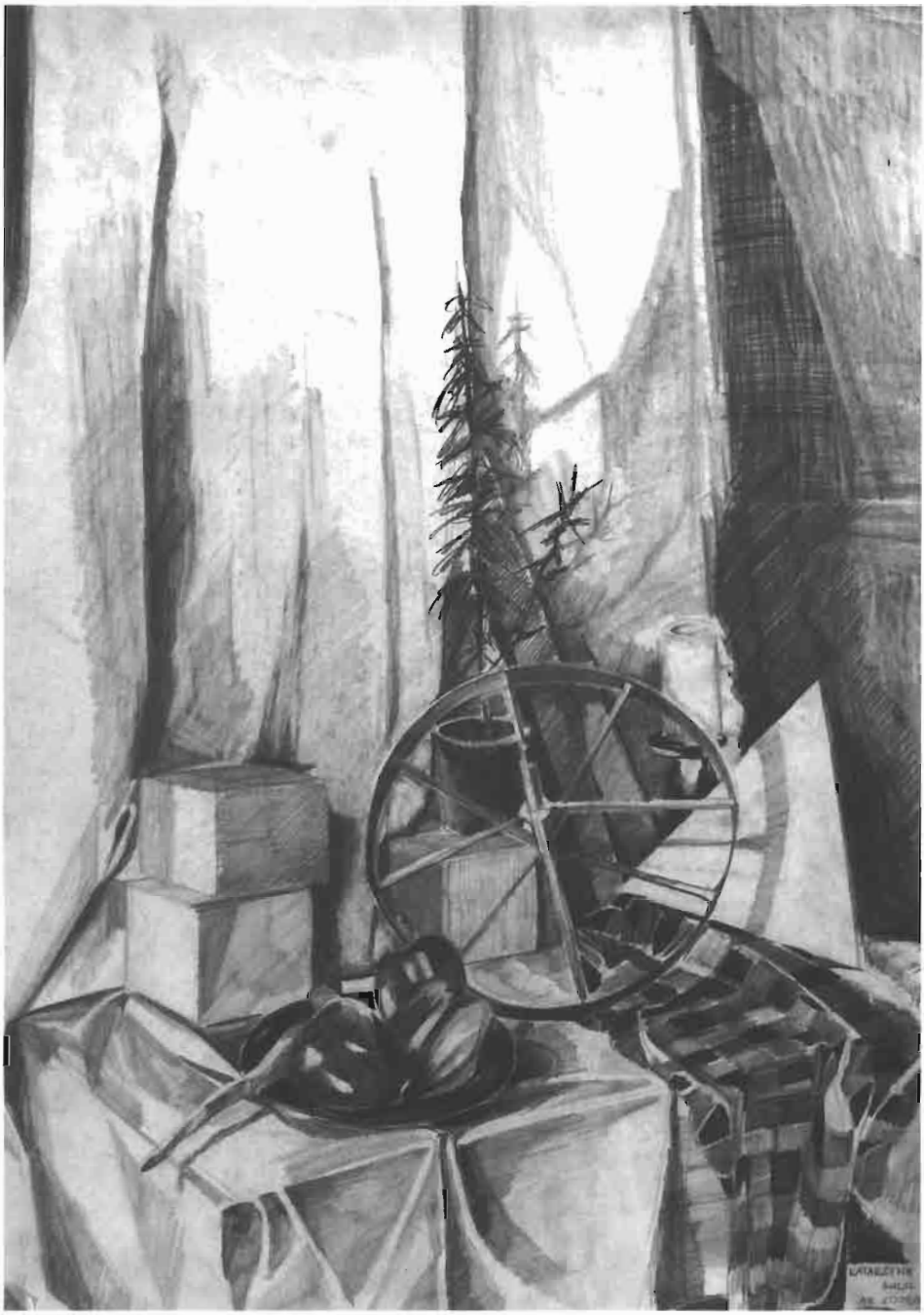
- the organization of field laboratories and conducting field geotechnical studies of natural soils and industrial waste on engineering sites

Most important research projects

- N N523 453736, *Laboratory research and numerical modelling of hydraulic flow conditions in ecological fish passages*, dr hab. inż. Leszek Książek (PhD Eng.), 2009–2011, Ministry of Science and Higher Education
- N R 14 004106, *Application of biological passages in hydrotechnical structures for the restoration of diadromous fish species*, prof. dr hab. inż. Wojciech Bartnik (Prof. DSc Eng.), 2009–2012, National Centre for Research and Development
- N N523 424237, *Assessment of hydrodynamic conditions of the watercourse in the riverbeds with oversized grains*, prof. dr hab. inż. Wojciech Bartnik (Prof. DSc Eng.), 2009–2011, Ministry of Science and Higher Education
- N N305 295037, *Assessment of the potential agricultural use of bottom sediments in water basins*, dr hab. inż. Marek Tarnawski (DSc Eng.), 2009–2012, National Science Centre
- N N523 610339, *Evaluation of the impact of slope seals on filtration by ash-slag embankments*, dr inż. Mariusz Cholewa (PhD Eng.), 2010–2012, Ministry of Science and Higher Education
- RPPK.04.02.00-18-001 / 08, *Identification of flood hazard in the Wisłok catchment area*, dr hab. inż. Leszek Książek (DSc Eng.), 2009–2010, Regional Operational Program for Podkarpackie Voivodship 2007–2013, Małopolska Geodesic and Design Group, Regional Water Management Board in Kraków
- PIOS-05.02.00-00-182-09-00, *Restoring connectivity in the ecological corridor of the Wisłok river and its tributaries concerning the improvement of habitat structure for fish below the weir in Mokrzec*, dr hab. inż. Leszek Książek (DSc Eng.), 2011–2014, European Regional Development Fund 2007–2013, Regional Water Management Board in Kraków
- PIOS-05.02.00-00-182-09-00, *Development of solutions for restoring barrier connectivity for the migration of aquatic organisms on the Wisłoka, Ropie and Jasionka rivers*, dr inż. Maciej Wyrębek (PhD Eng.), 2013–2014, European Regional Development Fund 2007–2013, WTU Sp. Z o.o., Regional Water Management Board in Kraków
- European Economic Area Financial Mechanism project 2009–2014, *Crisis management in the Nature 2000 area under flood conditions, as seen on the example of the Vistula River Gorge* in *Małopolska (at 254 + 000-307 + 00 km)*, dr inż. Jacek Florek (PhD Eng.), 2014–2017, National Fund for Environmental Protection and Water Management
- *Feasibility study for the hydrometric protection system of small catchments in the Upper Vistula basin, not covered by hydrological monitoring of the Institute of Meteorology and Water Management*, prof. dr hab. inż Bogusław Michalec (DSc

Eng.), 2014–2015, State Treasury – Małopolski Urząd Wojewódzki (Regional Office) in Kraków

- European Fisheries Fund project, Protection and management of aquatic fauna and flora; a measure of common interest, *Assessment of hydraulic diversification of water flow conditions in a fish passage resulting from the reconstruction of a weir on the San River at km 168 + 850,* dr. inż. Mateusz Strutyński (PhD Eng.), 2015, Municipal Water Supply and Sewerage Company in Przemyśl
- GW.6352.14.3.2015 *Pilot program for assessing lateral and bottom erosion processes along with a proposal for preventive action. Raba river basin*, dr hab. inż. Andrzej Strużyński (DSc Eng.), 2015–2016, State Treasury – Małopolski Urząd Wojewódzki (Regional Office) in Kraków
- 306/08/15/4000, *Assessment of quality, type and quantity of bottom sediments taken from the water reservoir in Rożnów*, dr hab. inż. Marek Tarnawski (DSc Eng.), 2015–2016, Małopolska Grupa Geodezyjno-Projektowa SA, Regional Water Management Board in Kraków



Still Life
Author: Katarzyna Kulig, Landscape Architecture
Work done under the direction of: Michał Uruszczak, PhD Eng. Arch.

Still Life
Author: Bernadeta Duch, Garden Art
Work done under the direction of: Michał Uruszczak, PhD Eng. Arch.

Still Life
Author: Baziak Agnieszka, Landscape Architecture
Work done under the direction of: Michał Uruszczak, PhD Eng. Arch.

Biogramy uczestników
Biographical Notes

Jean-Marc Châtaigner

Directeur général délégué de l'Institut de Recherche pour le Développement

Né en 1964, Jean-Marc Châtaigner est conseiller des Affaires étrangères au ministère français des Affaires étrangères et du Développement international. Après avoir été ambassadeur de France à Madagascar entre 2009 et 2012, il y occupait, jusqu'au 31 septembre 2014, les fonctions de directeur général adjoint de la mondialisation, du développement et des partenariats.

Ancien élève de l'École nationale d'administration (ENA), promotion «Jean Monnet» (1990), Jean-Marc Châtaigner est également diplômé de l'Institut d'études politiques de Bordeaux.

Débutant sa carrière en tant qu'administrateur civil au ministère de la Coopération et du Développement en 1990, successivement chargé de mission pour le Niger, le Mali, la Guinée équatoriale et le Tchad, il a ensuite été conseiller économique et gouvernance, et conseiller adjoint au chef de la mission de coopération et d'action culturelle de l'ambassade de France en Côte d'Ivoire (1992–1995).

En 1995, Jean-Marc Châtaigner a rejoint le ministère de l'Économie et des Finances pour occuper les fonctions d'attaché financier à la mission permanente de la France auprès de l'ONU à New York. Il a notamment été le représentant de la France dans les conseils d'administration de l'UNICEF, du Programme des Nations Unies pour le développement (PNUD) et du Fonds des Nations Unies pour la population (FNUAP). En 1998, il a été nommé second conseiller en charge du suivi des dossiers africains au conseil de sécurité de l'ONU, au sein de la mission permanente du ministère des Affaires étrangères.

En 2001, Jean-Marc Châtaigner est nommé directeur adjoint du développement et de la coopération technique au ministère des Affaires étrangères, avant d'être détaché auprès de l'Agence française de développement (AFD) en 2004 en tant que directeur du département du pilotage et des relations stratégiques. De 2007 à 2009, il a également occupé les fonctions de directeur de cabinet du secrétaire d'État chargé

de la Coopération et de la Francophonie, et de directeur adjoint du ministre chargé des Affaires étrangères.

Jean-Marc Châtaigner est spécialiste des questions de développement international, de sortie de crise et du fonctionnement du système multilatéral. Dans le cadre du comité d'aide au développement de l'Organisation de coopération et de développement économiques (OCDE), il a coprésidé le groupe « États fragiles » (2007–2008) et le groupe développement du processus dit d'Heiligendamm, qui associait les membres du G8 et du G5 (2008–2009). En 2014, il a présidé également à l'ODCE le réseau d'évaluation de l'efficacité de l'aide multilatérale (MOPAN). Il est, à titre personnel, administrateur du comité français pour l'UNICEF et membre du conseil d'orientation stratégique d'Interpeace à Genève.

Jean-Marc Châtaigner est notamment l'auteur de *L'ONU dans la crise en Sierra Leone. Les méandres d'une négociation*, publié en 2005 aux éditions CEAN et Karthala. Il a également dirigé d'études et de recherches sur le développement international de Clermont-Ferrand (CERDI), Jean-Marc Châtaigner est particulièrement attaché aux problématiques de transmission des savoirs et des connaissances issues de la recherche.

André Burnol

Head of Unit
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Dr André Burnol has more than 20 years of experience in hydrogeochemistry, and his research interests focus on the coupling of physical and (bio)geochemical processes controlling the mass transfer between water, gas and solid phases in porous media. He has developed numerical tools to simulate the reactive transport of metals and metalloids in groundwater. He defended a doctoral thesis in environmental geochemistry at the Grenoble University on the mobility of arsenic in the aquifers of the Delta of Bengal. He has conducted modelling studies in both porous and fractured media, and he performed sensitivity and uncertainty analyses. His current research topic concerns the safety of storage and exploitation of the sub-surface (e.g. CO_2 storage, gas hydrates, energy storage)

Experience

Head of Unit Risks of Underground Storage and Exploitation at BRGM
December 2013–current position (3.5 years)
Risks and Risk Prevention Division BRGM (French Geological Survey)
Research Engineer at BRGM
September 2002–November 2013 (11 years)
Water, Environment, Ecotechnologies Division BRGM (French Geological Survey)

Languages

German, English

Education

- Université de Grenoble Joseph Fourier – PhD, Environmental Geochemistry, 2005–2009, Grade: Summa Cum Laude with congratulations of the committee
- Ecole nationale supérieure de Techniques avancées – Master 2 (Diplôme d'Etudes Approfondies), Physical Oceanography, 1991–1992
- Ecole nationale supérieure de Techniques avancées – Ingénieur Génie Maritime, Option Environnement marin, 1990–1992
- Lycee Franco-Allemand de Buc – Bac C franco-allemand, Bac Scientifique, 1985, Grade: Mention Bien

Bożena Degórska

Doctor of Earth sciences, specializing in issues of spatial planning, working at the Institute of Geography and Spatial Organisation, Polish Academy of Sciences. Member of the Committee for Spatial Economy and Regional Planning, Polish Academy of Sciences.

Participant in several national and international research projects, including: Scientific and research basics of the concept of national spatial development policy (KBN project); Eastern zone of economic activity (PHARE program/FIESTA II), Landscape changes and open areas forming in the metropolitan area of Warsaw (KBN project); Governance of Territorial and Urban Policies from the EU to Local Level (ESPON project).

Member of Expert Groups, which developed inter alia: a draft of the development strategy for the Mazowieckie voivodship in various scenarios (1999), draft of the first edition of the Mazowieckie voivodship development strategy (2000), draft of the development strategy for Warsaw in the 2020 horizon. In recent years her interests focus on the processes of suburbanization and the functioning of urban areas in terms of quality of human life. Coordinator of studies relating to the adaptation of urban areas to climate change. Author of over 160 scientific publications.

Marek Degórski

Professor and director at the Institute of Geography and Spatial Organisation, Polish Academy of Sciences as well as Head of the Department of Geoecology and Climatology. Member of the Polish National Committee for cooperation with the International Council of Sciences and the Polish National Committee for ICSU-SCOPE and UNESCO-MAB, Committee of Geographical Sciences, as well as the Committee of the Polish Academy of Sciences for International Year of Planet Earth.

Member of the Executive Committee of IYPE in the International Geographical Union and the European Geosciences Union (EGU). Representative of Poland in GEO Working Group of the European Commission (2004–2005). Speaker and member of Advisory Boards and Task Forces for several European Projects and Programs including Landscape Tomorrow, Integrated Environmental Monitoring of Europe, Vistula ECONET Development and Implementation. Member of the State Council for Spatial Development, designed by Prime Minister of Poland and State Council for Nature Conservation. Author of over 380 scientific publications.

Ievgenii Gerasimov

Address: Pushkina str., 5, app. 65, 33028,
Rivne, Ukraine
Telephone: +38 067 2877102
E-mail: e.g.gerasimov@nuwm.edu.ua
Date of birth: 13 April 1971
Sex: Male
Marital status: Married

Education/Qualifications

2000 PhD in Hydrotechnical amelioration, Rivne State Technical University, Rivne, Ukraine.
Title of the doctoral thesis: Increasing the reliability of close irrigation network with air chambers.

1995–1998 Ukrainian State Academy of Water Management Engineering, Rivne, Ukraine. Postgraduate programme completed in 1999.

1988–1993 Ukrainian Institute of Water Management Engineering, Rivne, Ukraine. MSc in Hydrotechnical engineering structure with honours, obtained in 1993.

Employment to Date/Work Experience

2013–present Research department of the National University of Water and Environmental Engineering, Rivne, Ukraine
Post: Head
Main direction: coordination of research works, preparing grant programmes.

2014–present Associate professor at the Department of Hydraulic Engineering Constructions, National University of Water and Environmental Engineering, Rivne, Ukraine.

2005–2013	Associate professor at the Department of Ameliorative Systems Operation, National University of Water and Environmental Engineering, Rivne, Ukraine.
2000–2005	Senior Lecturer at the Department of Ameliorative Systems Operation, Ukrainian State University of Water Management and Nature Resources, Rivne, Ukraine.
1998–2000	Assistant at the Department of Ameliorative Systems Operation, Ukrainian State Academy of Water Management Engineering, Rivne, Ukraine.

Other Experience/Activities

2011–2015	International grant programme: Development of three study modules in water management and technology for Ukraine, Byelorussia, Kazakhstan and Tajikistan harmonised with Norway ("Water Harmony"). Post: Partner.
2015	Global water partnership. Post: Coordinator on the part of the National University of Water and Environmental Engineering, partner.
2001–2005	Water Management Institute of Ukrainian State University of Water Management and Nature Resources, Rivne, Ukraine. Post: Deputy director.
2009	Scientific journal "Bulletin of National University of Water and Environmental Engineering", Rivne, Ukraine. Post: Executive secretary.
Languages	Ukrainian: native; Russian: native; English: good; Polish: good passive skills.
Interests	Water resources management, environmental science, irrigation, drainage, hydrotechnical structures, river hydraulics, water hammer, reliability of irrigation network.

Publications

1993	More than 50 scientific and educational papers, manuals, textbooks with educational recommendation. More than 10 patents of Ukraine.

Realized projects

2011–2015	Eurasian training project "Water Harmony" with activities relating to water resources management and water treatment; between the Norwegian University of Life Sciences (NMBU), NTUU "KPI", Ukrainian State University of Chemical Technology (Dnepropetrovsk); Cherkassy State TU; National University of Water and En-

	vironmental Engineering (Rivne); Belarusian State TU (Minsk); South Kazakhstan State University (Shymkent); Mining and Metallurgical Institute of Tajikistan (Hudzhand). Funding for the project included in the program of EURASIA, provided by the Ministry of Foreign Affairs of Norway through grants, and for 2011–2014 this is 5 million Norwegian Krones.
2015–2016	National political discussion "Rethinking of water security for Ukraine"

Jerzy Grela

An inland waterway engineer, specializing in dams and water power stations (graduate of the Cracow University of Technology), with 41 years' professional experience.

Specialist in broadly understood water management, including:

- protection against flooding,
- water balance,
- algorithms and criteria for controlling retention tanks,
- quantitative and qualitative modelling of river channels,
- implementation of EU legislation (Water Framework Directive, Flooding Directive);
- construction of flood prevention investment programs,
- construction of water management plans,
- carrying out environmental assessment.

He possesses experience in conducting and coordinating research works, managing public administration offices, supervising projects carried out within the framework of the World Bank and European Union funds, operational steering of the reservoir system during floods (upper Vistula region, 2010), supervision of construction of hydrotechnical facilities (Świnna Poręba retention tank), conducting university-level lectures for students (Warsaw University of Life Sciences, University of Agriculture in Krakow).

Work experience:

1974–2003	Researcher at the Institute of Meteorology and Water Management, Krakow Branch
2003–2012	Deputy Director and Director of the Regional Water Management Board in Krakow
2013–present	Chief Consultant for Water Management MGGP S.A.

Benoît Jourdan

Area Manager, BRGM

Dr Benoît JOURDAN received his Master's degree in Engineering from Ales School of Mines, a French "Grande Ecole" member of the prestigious "Mines – Telecom Institute". He holds a Ph.D. in Environmental Sciences with specialisation in industrial hazardous waste management. He began his career in 1997 as a Scientist in the Research Laboratory conducting studies on hazardous waste management. He developed innovative ways towards the valorisation of high-quality steels and oils from grinding operations in the bearing industry.

In 2002 Dr. Jourdan served as Head of the Environment and Energy Department for the Regional Chamber of Commerce and Industry. He worked closely with local government to promote commercial activity, entrepreneurial skills and job creation in the region. He joined BRGM in 2005 as a Project Manager.

Two years later, he was appointed as International Officer, and in 2010, he was promoted to Area Manager. His responsibilities cover full range of activities of BRGM which include Geology, Mineral Resources, Geothermal Energy, Risks, Post-mining, Water management, Environment and Eco Technologies, Laboratories and Information Systems. In his spare time, he enjoys spending quality time with his family, skiing, biking and hiking.

Claudine Kieda

Centre de Biophysique Moléculaire, Glycobiology, Centre National de la Recherche Scientifique, CNRS

University studies and titles:

1977 third cycle thesis
1979 PhD
1980 Habilitation Thesis (DSc)

Positions and stays

1977 Weizmann Institute of Science, Department of Biophysics, Rehovot, Israël (Head: Prof. Nathan Sharon) – Laureate of the E.M.B.O; Laureate of the Feinberg Foundation.

1981–1983 Postdoctoral researcher – National Institutes of Health, Laboratory of Immunology, National Institute of Allergy and Infectious Diseases; Bethesda, Maryland, U.S.A. (Head: Professor William E. PAUL) Fogarthy Foundation fellow.

1990 Research Director – CNRS, team: "Glycobiology: intercellular Recognitions".

2007 Head of Department New Therapeutic Targets and Vectorisation (NTTV).

Teaching

1987 Lectures in Immunology for Master degree and PhD students. Biochemistry, University of Orléans.

1994 Associate at the Jagiellonian University, Biotechnology.

1995 Coordinator of TEMPUS, SOCRATES-ERASMUS student exchange program.

2000 Lectures at Master Pasteur Institute.

2013 Lectures at Institute Gustave Roussy "cancer immunotherapy" Master.

Societies

French Carbohydrate Group
The Glycobiology Society
Cellular Biology Association
French Society of Immunology
The Society for Leukocyte Biology
The Polish History and Literature Society – Paris Polish Library
The Polish Humanitarian Fund
Foreign member PAU

Distinctions

CNRS medal for research, 1983
Polish: National Merit, 1998
Merentibus of the Jagiellonian University Krakow Poland, 2006
"Solidarność" Medal, 2007
Copernicus Medal PAN, 2009
Full Professorship, 2011

Research subject

"Molecular Mechanisms of intercellular recognitions in invasive phenomena",
Responsibility of the common flow cytometry facility,
Responsibility of the foreign exchange of students and researchers,
Doctorate Thesis supervision (15 to date, plus two to be defended this year),
Joint supervision of two theses,
Master degree supervision: one student per year,
Student stays: coordination of the stays of six Polish students per year,
Responsibility for international exchange and research programs.

- Joint laboratories CBM-CNRS/Ludwik Hirszfeld Institute of Immunology, Polish Academy of Sciences, PAN.
- Tempus European Interuniversity Teaching Exchange Orleans-Cracow program.
- Socrates-Erasmus Program Orléans-Cracow.
- Coordinator of the GDRE (groupement de recherche européen) on cancer research "host tumour interactions"
- Coordinator of the French-Polish consortium on oncology (French).
- Scientific advisor and member of the council of the "Studium of molecular medicine", International postgraduate school.
- Responsibility for the double French-Polish Master degree teaching in Life Sciences (Orleans-UJ).
- Responsibility for the double French-Polish doctoral degree in Life Sciences (Orleans-UJ).
- Creation of the LIA "International associated Laboratory MiRTAngO" between France CNRS and Poland – Jagiellonian University (BBiB).

Agnieszka Kowalczyk (PhD Eng.)

Graduated from the Faculty of Environmental Engineering, Cracow University of Technology, Poland (MSc 2003), and in the same year started a postgraduate PhD course at the said faculty. She both lectured and had practical experience in hydraulics, fluid mechanics and hydrology. Awarded a PhD degree (2008) at the Faculty of Environmental Engineering, based on her dissertation "Fuzzy modelling in the strategy of group decision for water engineering". Participated in various research projects focusing on environmental engineering for the Institute of Technology and Life Sciences, Regional Water Management Board, European Development Centre INTEGRAL – conducted trainings and debates on responsible use of the natural environment – "Protection of water resources" (2009). Recently participated in a few international projects (e.g. SaLMaR, FACCE MACSUR, FINEGRASS, 2012–2017). At present deals with erosion processes, pollution sources and water quality protection in Polish mountain regions. Author of 40 papers and reports.

Marek Kopacz (MSc, Eng.)

Prof. ITP, graduated from the University of Science and Technology in Kraków (MSc 1996), and from the Institute of Technology and Life Sciences at Falent, where he completed his doctorate (2002) and habilitation (2012) in the field of environmental protection. FAO fellow in agrometeorology (1999, Italy). Involved in the EC BIOFORUM project, he specialises in information technology as applied in land use and water quality studies. Task leader of the project: "Determinants of surface water quality of agriculturally used mountain catchment (based on the example of studies in the Raba River basin)". He participated in the research project No. N520 021 31/2970 "Modelling the impact of land use on the potential load of sediment accumulated in reservoirs using multi-temporal remote sensing images and geographic information systems" (2006–2009). He conducted a training course on "Protection of water resources in rural areas" for high school students in southern Poland (2009–2010; EEA, FOP). His professional experience and key achievements include: forming the land use structure and spatial order; pollution and water quality protection; nature protection, biological and landscape biodiversity of mountain regions (the Carpathians). He is the author of 90 papers and reports.

Robert Kurnicki (PhD Eng.)

Graduated in 1996 from the Faculty of Mining Geodesy and Environmental Engineering at the AGH University of Science and Technology, obtaining a Master's degree in Environmental Engineering in the field of environmental planning and management. In 2001, at the Faculty of Geology, Geophysics and Environmental Protection (AGH), he defended his doctoral dissertation titled "Model of the use of natural resources of Vistula River valley between estuaries of Dłubnia and Raba rivers", obtaining the degree of Doctor of Earth Sciences. Parallel to his doctoral studies, he completed the AGH Postgraduate Studies on the "Protection of Natural Environment and Mineral Resources" by presenting the elaboration "Digital map of illegal dumping grounds in the Cracow province" which received an "excellent" grade. He spent several years in the United States of America, working and learning at the same time. He received diplomas of Business Industrial Resources Training Center (Chicago, IL) and certificates of completion of the following programmes: CNC Machine Tool Operations and Applied Business Communications. Upon returning to Poland, he worked in a private college as a specialist for the organization and quality of studies and Head of the Office of Careers and International Cooperation. In 2009–2011, he served as Deputy Inspector in the Marshal's Office of the Małopolska Voivodeship. Regional Manager of "Sensitive customer (participant) of POKL projects". Since 2012, employed at the Institute of Technology and Life Sciences (ITP), Małopolska Research Centre, amongst the others, as an expert for the implementation of international research projects. Co-author of several scientific publications. Director of the ITP Małopolska Research Centre in Kraków since January 2017.

Ewa Laskosz

Ingénieur civil de l'environnement avec spécialisation d'hydrologie et de gestion de l'eau (Diplômé de l'Université technique de Cracovie)

Le certificat de qualification d'effectuer les documentations hydrologiques, le numéro 11/2004, délivré par le Ministre de l'Environnement le 19.07.2004.

20 ans de travail

Expérience dans la réalisation des travaux d'étude et projets dans la domaine d'une large gamme de la gestion de l'eau et protection de l'environnement, a la fois en tant que un designer et un manager de projets (par ex.: les évaluations environnementales, programmes d'investissement, études de faisabilité).

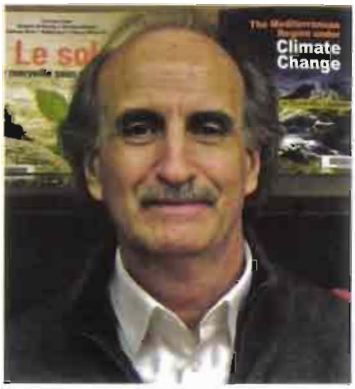
Par son travail professionnel elle participe a la mise en œuvre de législation européenne (directive cadre sur l'eau, directive sur les risque d'inondation et de sa gestion). Elle participe aussi dans la réalisation des projets financés par le Bank Mondiale. Elle a travaillé comme le Consultant pendant la réalisation des Plans Locaux de Limitations des Effets des Inondations et de les Prévention pour chaque unité pilotage. Elle dirige actuellement la société avec de 256 employées qui réalisent des projets de domaine de géo information, de l'environnement et d'ingénierie.

Expérience professionnelle:

III 1995–VII 1996	Direction Régionale (Départemental) de l'Eau à Cracovie- Spécialiste du contract et du règlement
VIII 1996–VII 1998	La société des traveaux ingénieries à Cracovie – Ingénieur de la construction
VIII 1996–VII 1998	Hydroprojekt Kraków Sp. z o.o. – assistant, assistant principal
XI 1999–VI 2001	Le Contract pour les services consultatifs dans le project de Bank Mondiale pendant la realization des Plans Locaux de Li-

	mitations des Effects des inondations et de les prévention dans la domaine de soutien et mise en oeuvre de ces Plans.
I 2000–2009	Travailleur autonome: Environnmental Engineering – Co -propriétaire et Propriétaire Gestion de projects, services consultatifs dans la domaine d'hydrologie, gestion de l'eau et aussi des évaluations environnementales.
IX 2009–XII 2009	Mott MacDonald Limited Sp. z o.o. Section en Pologne – Chef de l'équipe de protection environnemental à Cracovie, Chef de Project
I 2010–VII 2011	Mott MacDonald Polska Sp. z o.o. – Chef d'équipe de protection environnemental à Cracovie, Chef de Project, Directeur adjoint du bureau à Cracovie
X 2011–IV 2013	Directeur du Bureau de Protection Environnemental
IV 2013–IX 2014	Vice Président du Conseil de MGGP S.A.

IX 2014 – jusqu' à maintenant Président du Conseil de MGGP S.A.



Jean-Pierre Montoroi

Engineer in Agronomy, University Doctor in Pedology, Senior Researcher at the Institute of Research for Development (IRD), member of the Joint Research Unit Institute of Ecology and Environmental Sciences of Paris (IESS-Paris). His fields of scientific interest mainly concern soils affected by physico-chemical degradation (salinization, acidification), in dry tropical (Senegal, Thailand) and Mediterranean (Tunisia, Egypt, Algeria) regions, under rainfed and irrigated conditions.

Jean-Pierre Montoroi is a senior research scientist at IRD (Institute of Research for Development) and is currently based at Bondy in the vicinity of Paris. His particular skills are in soil science, mineralogy, geochemistry as well as geophysics as applied to salt-affected soil processes under various forms of soil and water management.

After graduating as an agronomy engineer in 1979 (National Agronomy Institute of Nancy, France), he joined IRD in North Africa (Tunisia) for four years to conduct research on irrigated saline soils. During a six-year stay in West Africa (Senegal), his research focused on the management of saline and acid sulphate soils using small anti-salt dams. He completed his PhD in 1994 at the University of Nancy. Since 1992, he has been posted to Bondy and has continued to work abroad during short or long-term missions. Initially, from 1997 to 2001, he conducted research projects on the hydrological and geochemical functioning of hill reservoirs in Tunisia. Then, from 2002, he worked in Thailand, especially in the north-eastern region severely degraded by salinization, where between 2004–2007 he participated in a project on the management of salt-affected soils, and between 2007–2010, in a project on the impact assessment of planting rubber trees on sandy soils. From 2011 to 2013, he joined a French-Egyptian research program entitled "Sustainable management of adverse impacts on farming and soil ecosystem associated with long term use of low quality irrigation water" (Nile

delta and Sinai region). From 2014 onwards, he has been working in a research program, which he had initiated, on the remediation of saline clayey soils in Central Tunisia (Kairouan region).

He participated in two projects funded by the European Union in Senegal and in Tunisia, and was the head of a two-year French-Thai project (from 2005 to 2007) funded by the Ministry of Higher Education and Research. He has also worked as a consultant for Canadian and European projects. He has supervised the research of 25 MSc and PhD students and has taught at the University of Creteil for nearly 15 years, among other institutions. His publishing credits include 52 articles, 2 edited books, 6 book chapters and over 100 proceedings and reports. He is an editorial board member of a French journal « Etude et Gestion des Sols » and a scientific expert with the International Foundation of Science for nearly 20 years.

Jerzy J. Nizińśki

Né le 1er juin 1951 à Wrocław (Pologne)

Diplômes: Habilitation à Diriger des Recherches (Université d'Orléans, Orléans) en 2007; Thèse Docteur-Ingénieur (Université Paris-Sud, Orsay) en 1986; Diplôme d'Etudes Approfondies – DEA (Université Paris-Sud, Orsay) en 1981; Sous-lieutenant (Ecole des Officiers de Réserve, Wrocław, Pologne) en 1978; Diplôme d'Ingénieur (Ecole Agronomique, Wrocław, Pologne) en 1977

Langues (parlé, lu, écrit): polonais, français, anglais; après remise à niveau: allemand, russe

Relations suivies avec les partenaires scientifiques: Anglais (Institut of Terrestrial Ecology, Edinburgh; Institute of Hydrology, Wallingford); Polonais (Académie Polonaise des Sciences, Paris); Roumains (Université de Bucarest); Congolais (Université de Brazzaville); Burkinabais (Institut de l'Environnement et de la Recherche en Agronomie, Ouagadougou); Egyptiens (National Research Center, Caïre); Tunisiens (Institut National de Recherches en Génie Rural, Eaux et Forêts); Sénégalais (Université Cheikh Anta Diop, Dakar) et Africains du Sud (CSIR, Scottsville); Thaïlandais (University of Kasetsart) et Indonésiens (Indonesian Oil Palm Research Institute, IOPRI); partenaires américains: Etats-Unis (The University of Arizona) et Brésil (Université de Manaus)

Membre du Conseil d'Administration du Groupe « LAMIE » (Mutuelle), Paris; de l'Association des Ingénieurs et Techniciens Polonais en France (AITPF), Paris ; de l'Association Loire-Vistule, Orléans ; Membre des « FUTURIBLES INTERNATIONAL », Paris ; Membre de l'Association Internationale de Climatologie, Paris

Itinéraire scientifique: je travaille depuis 1976 sur le cycle de l'eau, sur l'évapotranspiration réelle des couverts végétaux, domaine d'étude de la bioclimatologie. J'ai abordé les grandes problématiques de ma discipline: (a) le déterminisme du flux d'eau dans le système SPAC, les systèmes de régulation de ce flux (modèles phénologiques, modèles de régulation stomatique, d'absorption racinaire) ; (b) l'in-

cidence de la modification des couverts sur l'évapotranspiration (déboisement et reboisement) et sur le climat régional ; (c) l'impact de la contrainte climatique (hydrique et énergétique) sur la production végétale. J'ai travaillé dans des écosystèmes de physionomie différentes: des couverts fermés herbacés (savane), des couverts fermés arborescents (forêts), des couverts fermés non homogènes (savane arbustive avec zone herbacée et bosquets arbustifs et arborescents disséminés) assimilables actuellement, pour la modélisation, à une végétation éparse (recouvrement du sol par la végétation non complet). J'ai travaillé dans des climats différents: la zone tempérée (production de plusieurs espèces maraîchères, forêt de chênes), la zone tropicale humide (forêt tropicale humide en Guyane française; plantations d'Eucalyptus et savane au Congo; plantations d'hévéas au Ghana et en Côte d'Ivoire) et la zone subtropicale sèche (savane boisée du nord du Sénégal; orangeraie du Nord de Sinaï, Egypte; plantation des grenadiers dans la plaine en Tunisie Centrale).

Publications (243 – journaux scientifiques, ouvrages, communications à des congrès internationaux, rapports d'expertises, etc...) ; Encadrement d'étudiants (25 – Thèses, Diplômes d'Etudes Approfondies, DESS, Master M2, diplômes d'Ingénieur, Maîtrises, Licences) ; Elaboration de projets (39) www.documentation.ird.fr/hor/NIZINSKI,JERZY/tout

Zygmunt Leonidas Ostrowski

Nationality French
Address 3, Square du Rhône, 75017 PARIS (France)
Languages French, English, Polish, German, Russian, Arabic (basic)

Diplomas

MD University Paris VII (medicine) (1972–1976)
MPH Public Health School, ENSP Rennes (Public Health and Nutrition) (1970–1972)
MPH School of Public Health, A.M., Warsaw (Public Health), (1969–1970)
MAfrSc University of Warsaw (African Sciences with Arabic language) (1962–1964)
PhD Polish Academy of Science, Warsaw (1962–1968)
MD Faculty of medicine, Szczecin (1951–1956)

Specialist in Paediatrics, Nutrition, Public health, Art-therapy, geopolitics

Status

European Association for Child Development, President since 1976
World Health Organization, Acting Regional Advisor, MCH, Manila, 1986
UNICEF/NGO Committee for Eastern & Central Europe, Member 1987–2000
ADE Research Centre in Paris and in Sudan, Direction 1978–1984
ADE Centre for Children in Distress (School of Art) Sudan and Uganda, Direction 1992–2003
Hôpital Trousseau in Paris, Paediatrician since 1978
Negotiations in Sudan

- Hostage negotiations (emissary of the French government) (1984–1985)
- Political negotiations (1989–2011)

Humanitarian actions in SUDAN, OUGANDA, Poland 1986–2003

Scientific research projects in Sudan, France, Poland, Switzerland, Belgium, Luxembourg and China.

Publications: 15 books and 86 scientific articles:

- *Nutrition and Development, Nutritional status of pregnant women in Sudan*, ADE, Paris, 1982
- *Tables d'alimentations*, Ed J. Lanore, Paris, 1986
- *L'état nutritionnel des enfants de 0 à 3 ans dans trois pays européennes*, ADE Paris, 1988
- *La stimulation intellectuelle au toute début de la vie*, UNESCO, ADE Paris, 1989
- *Dynastree, Genealogy & Genetics, Computer Programme*, Paris, 1990
- *Soudan, Coulisses d'une guerre oubliée*, Harmattan, Paris, 2001
- *Soudan, A l'aube de la paix*, Edition Harmattan, Paris, 2005
- *Soudan, Conflits autour des richesses*, Edition Harmattan, Paris, 2010
- *Geopolitics and reality, Edition Khartoum, 2013, in Arabic language*
- *Health and Nutritional Status in the Southern Sudan*, Edition Ahfad University, Omdurman, 2015
- *Le Baroudeur mondain*, Edition Harmattan, Paris, 2016
- *La stimulation intellectuelle au toute début de la vie*, Harmattan, Paris, 2017
- *POLATAKA – Les couleurs de la vie*, (peintures des artistes soudanais), to appear, 2017
- *Les Deux Soudan*, to appear, 2017
- *Spotkania światowe*, to appear 2017

Awards

- Officer of Polish Order of Merit
- UNICEF Order of „SMILE"

Member of SPLM since 1984

References

Dr Bernard Kouchner, ex Minister of French Ministry of Foreigeedn Affairs
Dr Lam Akol Ajawin, ex Minister of Sudan Ministry of Foreign Affairs
Professor Guy Leverger, Head of University Hospital Trousseau, Paris

Presence in Sudan since 1977

Between 1977 and 1984, in the framework of the ADE European Association for Studies on Nutrition and Child Development, Dr Zygmunt L. Ostrowski organized a scientific research project: HEALTH, NUTRITIONAL AND SOCIO-CULTURAL STATUS OF THE NILOTIC POPULATION IN THE SOUTHERN SUDAN.

A general protocol of the ADE research project signed with the Sudanese Ministry of Health and the National Research Council in 1979.

Because of the national project to develop the South Sudan, a rapid socio-economic and environmental change was expected. The choice of the Jonglei Canal Area was dictated by the fact that basic data should be obtained before any changes occur, especially as the Jonglei Canal was the biggest environmental investment project in the world at that time (1978) and it was planed to be finished within 4–5 years.

A health and nutritional longitudinal study was carried out between 1979–1984 in the Jonglei Canal Area to determine the main health and nutrition problems and to provide the Sudanese Authorities with information for establishment of an adequate health and nutritional policy.

The collaboration of Sudanese specialists was assured by:

- Ministry of Health of the Republic of the Sudan, Khartoum
- Emergency Children's Hospital, Khartoum (Dr Gaffar Ibn Auf Suliman)
- Omdurman University College for Women (Prof. Yusif Badri and Prof. Gassim Badri)
- Faculty of Medicine, Biochemistry Department, Khartoum (Prof. Riad Bayoumi)
- ADE Research Center Sobat Jonglei (Miss Elisabeth Ojaba)

The collaboration in different fields of research was assured by the ADE Research Centre in Paris and different Institutions and Research Units in Paris, London, Cardiff, Brussels, Munich, Atlanta and Warsaw, as well as by the World Health Organization, Department of Nutrition, Geneva and the West African Health Community, Lagos.

Between 1984 and 2004, hostage negotiations and political negotiations in Sudan.

Between 1978 and 1984, directorship of the ADE Research Center in Jonglei Canal, Sudan.

Between 1989 and 1995, humanitarian actions in South Sudan (co-financed by the French government and UNICEF).

Between 1992 and 2003, directorship of the Center for Children in Distress and School of painting "POLATAKA" in South-Sudan and Uganda.

Between 1992 and 2005, advisor (Dr John Garang de Mabior, SPLM).

Between 2007 and 2013, advisor for various French projects in Sudan.

Since 2014, participation in UN sessions against sanctions in Sudan.

Activities in the field of childhood and of the UN human rights

Resolution given at the United Nations Headquarters in New York, June 16, 1992 (This resolution concerns the rights of children, victims of the war).

Participation in the "Children in war" seminar in Amman (Jordan), September, 14–17, 1992.

Participation at the International Conference on Human rights in Vienna, June 1994. Dr. Ostrowski drew the attention of the international community to the plight of the forgotten children of Polataka (South Sudan).

Presidency of a Round-table conference on „Children in military conflicts" at the Symposium of the Committee of NGOs to the United Nations (UNICEF) for Eastern and Central Europe, Warsaw, March, 22–26, 1993.
Organization of a Round Table on „Children in military conflicts in Eastern and Central Europe" for the NGOs/EEC Committee with UNICEF in Geneva, March 1995.
Participation at the Session of the Human Rights at the United Nations in Geneva, on Sanctions on Sudan, February 20, 2014.
Participation at the Session of the Human Rights at the United Nations in Geneva, on Sanctions on Sudan, September 17, 2014.
Participation at the Session of Human Rights at the United Nations in Geneva, on Sanctions in Sudan and on the implementation of the resolutions of ICC against the President of Sudan, March 16, 2015.
Participation at the Session of Human Rights at the United Nations in Geneva, on Sanctions on Sudan, September 28–30, 2015.
Participation at the Session of Human Rights at the United Nations in Geneva, on Sanctions on Sudan, March 18, 2016.

Abilities

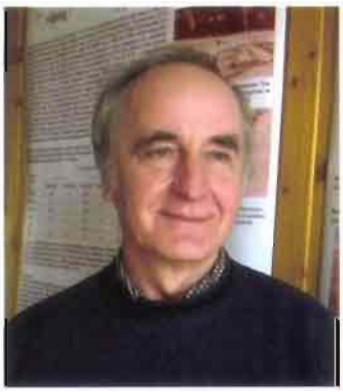
- Analytical capacity and research skills.
- Ability to work with scientific and research teams.
- Ability to interact positively with high-level government officials and the diplomatic community.
- Ability to organize teams and projects (conscientious and efficient in meeting commitments, observing deadlines and achieving results).
- Knowledge of sanctions-related issues and developments in Sudan
- Substantive knowledge and field experience in Sudan.
- Knowledge of the relevant national, regional and international actors and organizations working in the Sudan.
- Ability to develop a sound investigative case study featuring corroborated information from credible sources, and ability to synthesize this information into an easily-readable case study.
- Ability to treat sensitive or confidential information appropriately.
- Ability to work independently and resist political pressures.
- Ability to work under pressure and in dynamic situations.
- Understanding of sanctions regimes in the United Nations, regional organization or Member State setting. Knowledge of the United Nations' institutional structure, mandates, policies and rules.
- A long responsible experience in relevant fields (UN, NGO, Scientific teams...).
- Significant field experience in conflict, post-conflict and other transitional situations.
- Field research and investigative experience in different areas of expertise.
- Experience in writing reports.

- Proven interpersonal skills in complex, political and structured working environments.
- Understanding of sanctions regimes in the United Nations and regional organizations.
- Experience in working under the rules and regulations of the United Nations organizations and their working culture and methods (World Health Organisation).
- Experience of extensive travel in difficult environments.

Mohamed Saber

Prof. Dr. Mohamed Saber was born in Egypt in 1941, awarded his BSc in soil science (1961), MSc in Microbiology (1966), and PhD in Microbiology (1969). He joined the research staff at the National Research Center in 1962. During the period of 1999–2001 he acted as chairperson of Agricultural and Biological Division (NRC). He was granted the NRC Scientific Encouragement Award in Biological Sciences and its Applications (1982), ASRT Prize in Environmental Sciences (1989), NRC Scientific Excellence Award and Golden Medal (1991), Dr. Tolba Award in Environmental Technology (1998), University of Monofia Prize (2005), Scientific Syndicate Prize in science popularization (2006) and NRC Scientific Recognition Award (2014). He is a chairperson and member of many Egyptian and International scientific bodies, including the Egyptian Environmental Research Council, National Specialized Councils, Chairperson of Egyptian SCOPE Committee till 2016, and member in the Executive International SCOPE Committee, among others. He published tens of papers in the fields of environment, biology and agriculture as well as tens of international studies and reports. He authored many books (popular science) in Arabic. He supervised many MSc and PhD theses. His experience extends over more than 50 years in the fields of sustainable ecological farming systems, bioremediation of contaminated soil and aquatic ecosystems, use of bio-fertilizers in ecological farming systems, ecology of low quality water, sewage farming, solid waste management, ecology of soil biomass and soil health, biosafety, application of novel ecological biotechnology in clean farming, agriculture and environmental management, environmental legislation and executive regulations, environmental & agricultural biotechnology, risk assessment and risk management of ecosystems, environmental impact assessment, bioethics, rural sustainable development, technology assessment and feasibility studies. He acted as the Egyptian representative in the expert meeting of African academies and scientific councils on the African environment (Regional Office of Africa, UNEP, Lusaka,

Zambia, 1984), member of Egyptian delegation to the World Industry Conference on Environmental Management (UNEP), Versailles, France (1984), offered consultancy to Arab League in the field of "Environmental Problems in Arab Countries" (Sudan 1991), offered consultancy to UNEP in the field of "Desertification in UAE" (Bahrain 1992), offered consultancy to Islamic Conference in the field of organic farming (1994), offered consultancy to several national and international bodies, including AUODA, UNDP, SEAM, KFW, GEF, ESDF etc. (1995 till now) in the fields of rural development and environmental issues, prepared the Egyptian National Biodiversity Strategy and Action Plan (UNDP and GEF), and acted as a UNECSO expert (2016 till now).



Sylwester Smoroń (PhD, Eng.)

Graduated from Agricultural University in Kraków (MSc 1974, PhD 1986), specialises in soil science, agricultural chemistry and grasslands. For many years in charge of research tasks including anthropopressure on soil and water environment. At present the leader of task: Designation of agro-environmental indicators of agricultural land use intensity on the basis of NPK balance and water monitoring in the Szreniawa River basin. Participated in the project on "Polish agriculture and protection of water quality" USA-EPA 1992–1996. He conducted training programs on the dissemination of "good agricultural practice principles" in Małopolska district for individual farmers (2003) as well as training sessions in 50 communities within the framework of the project "Protection of water resources in rural areas" for high school students in southern Poland (2009–2010; EEA, FOP). He participated in various research projects focusing on environmental engineering for the Institute of Technology and Life Sciences, Regional Water Management Board, European Development Centre INTEGRAL – where he conducted training sessions and debates on the responsible use of the natural environment – "Protection of water resources" (2009). Recently participated in several international projects (e.g. SaLMaR, FINEGRASS, 2012–2017). Author of 107 papers and reports.

Lucjan Sobkowiak

Presently, the Owner-President & CEO of BEAMTECH Inc., USA and BEAMTECH TEAM FRANCE in France. He specialises in high precision metal joining techniques for aircraft and aerospace industries, nuclear industry, electronic and high precision industries, medical instruments.

In 1974, he created his first Advanced Technology Company in France "ADVANTECH" for the development of Electron Beam Technology, Laser Technology, Vacuum heat treatment and brazing Technology, CNC machines. In 1982, in France, he created another company called "ATELOR" with similar engineering program. In the same year, in German,y he created the Elektronen-Strahl-Technik Company to enter the German market. In 1989, after Bourget Aeronautics Salon in collaboration with Canadian Company Diemaster he created a Joint Venture "D&A" in Toronto, Canada. In 1992, in the USA, he created "BEAMTECH Inc., working for NASA aerospace program, for Pratt &Whitney, General motors, Honeywell, AMA and other companies. In 2009, in France, he created BEAMTECH TEAM FRANCE using Advantech Aeronautique Company technology and experiences.

For many years he acted as a representative of American companies such as ABAR Inc., SS Machinery, Textron (Jones & Lamson, Waterbury), and Compulaser; also UK Companies Wentgate and Torvac. The Electon Beam welding machines and vacuum furnaces developed by his companies are working in French, German, USA and Russian industries.

While working in French industry, he received the follow patents: Hydraulics motors, automobile global security control system, laser system for 900mW and 1200 mW Generators water ends repair in situ.

While working for the SOPELEM Group as their engineering manager, he developed and applied value analysis and value enginnering process.

Lucien Sobkowiak received MSc from Wrocław Politechnic in Poland, postgraduate degree in industrial automation from Warsaw Politechnic, Poland and post-

graduate degree in Hydraulic-electric control systems from ENSA (Ecole Nationale Supérieure Aeronautique), France with Prof. Faisandier.

He participates in many international conferences, meetings and technological exhibitions. He developed a new science called "Optomecatronics". He is member of American Welding Association, IMAPS Poland and Association of Polish Engineers and Techniciens in France.

Kazimierz Strzałka

Department of Plant Physiology and Biochemistry, Faculty of Biotechnology, Jagiellonian University

Education and academic positions

1953–1960	Primary school in Lubomia
1960–1964	Secondary school in Racibórz
1964–1969	Studies on Faculty of Biology at Jagiellonian University in Kraków
1969	MSc degree in Biology
1969–1974	Assistant (1969–1972) and senior assistant (1972–1974) at the Department of Plant Biochemistry, Institute of Molecular Biology, Jagiellonian University
1974	PhD
1974–1984	Adiunct (assistant professor), the same Department and University
1984	Habilitation in biochemistry
1984	Associate professor, leader of research group, the same Department and University
1986–1987	Visiting professor, Nagoya University, Japan
1987–1991	Vice-Director of the Institute of Molecular Biology
since 1992	Full professor in biochemistry, lecturer at the Institute of Molecular Biology (now Faculty of Biotechnology)
since 1997	Head of the Department of Plant Physiology and Biochemistry in the Institute of Molecular Biology, Jagiellonian University.
1999–2001	Director of the Jan Zurzycki Institute of Molecular Biology, Jagiellonian University.
2002	Director of the Jan Zurzycki Institute of Molecular Biology and Biotechnology, Jagiellonian University
2002–2008	Dean of the Faculty of Biotechnology, Jagiellonian University
2005–2007	Vice-President of Polish Society of Experimental Plant Biology
2007–2009	President of Polish Society of Experimental Plant Biology
2006	Corresponding member of the Polish Academy of Arts and Sciences
2008	Member of the Interdisciplinary Centre of Ethics at the Jagiellonian University

2008–2012	Member of the Central Library Council of the Jagiellonian University
2008	Member of the Convent of the Honorary Degrees and Distinctions of the Jagiellonian University
2009–2013	Secretary of the IVth Division of Natural Sciences of the Polish Academy of Arts and Sciences.
2010	Corresponding member of the Polish Academy of Sciences
2011	Member of the Council of Curators at the 2nd Division of Biological and Agricultural Sciences of the Polish Academy of Sciences
2011	Member of the Presidium of the 2nd Division of Biological and Agricultural Sciences of the Polish Academy of Sciences
2013	Member of the Steering Committee for the Laboratoire International Associe (LIA, CNRS).

Membership in scientific organizations and societies

Polish Biochemical Society; "Copernicus" Polish Society of Naturalists; Honorary member of Nepal Molecular Biology Society; Member of the Committee of Biochemistry and Biophysics of the Polish Academy of Sciences; Member of the Committee of Biotechnology, PAS; Member of Committee of Polar Research, PAS; Member of the Scientific Council of the Institute of Plant Physiology, PAS; Member of the Scientific Council of the Institute of Nuclear Physics, PAS; Member of the Scientific Council of the Institute of Botany, PAS; Member of Society for Photosynthesis Research; member of the Carotenoid Society.

Awards, honours and distinctions

Awards by: the Rector of the Jagiellonian University (1975, 1984, 1985, 1991, 1993, 1996, 2008); the Rector of the Łódź University (1984, 1988); Minister of Science and Higher Education (1985); Minister of National Education (1999). Golden Cross of Merit (5.10.1990) and Cross of Restitution of Poland (27.09.1999). Medal of Leon Marchlewski awarded by the Committee of Biochemistry and Biophysics, Polish Academy of Sciences in recognition of outstanding achievements in scientific work (2004). Diploma of the Honorary Ambassador of Polish Congresses (2012). Diploma and medal "Visita Distinguida" from Concepcion University, Chile, awarded in recognition of outstanding contribution for the development of scientific collaboration between Jagiellonian University and University of Concepcion (January 2015).

Teaching

Lectures and seminars in general biochemistry, plant biotechnology and related areas for students of biology, biotechnology and chemistry. Supervising several MSc and PhD students.

Visits to foreign laboratories

Ruhr University in Bochum, Oxford University (visiting fellow), Odense University, Arizona State University in Tempe, Liege University, National Biomedical ESR Center in Milwaukee, Nagoya University (visiting professor), University of Illinois at Urbana-Champaign, University of Quebec at Trois-Rivieres, Universityof Bielefeld, University of Concepcion, National Institute for Basic Biology, Okazaki, and several others.

Participation in scientific meetings

Participation in several domestic and international meetings including Gordon Conference, International Congresses of Photosynthesis, Photobiology and Biochemistry and many others

Others

Member of the Editorial Board of Acta Physiologiae Plantarum (1999–2012), Coordinator of the area of Biotechnology in the "AKCENT" Centre of the Advanced Technologies.

Katarzyna Turnau

Institute of Environmental Sciences, Jagiellonian University

Appointments

From 2014 head of Bioremediation Group in the Małopolska Centre of Biotechnology

2005–present: Professor, Institute of Environmental Sciences, Jagiellonian University, Kraków, Poland

2000–2005 Professor, Institute of Botany, Jagiellonian University, Kraków, Poland.

1982–2000 Assistant professor, Institute of Botany, Jagiellonian University, Kraków, Poland.

1977–1982 PhD student at the Jagiellonian University

International fellowships

May 1998 Fellowship of the French Ministry in Nancy (France) 1994 – research visits in France financed by Eurosilva (Eureka) and ECC project (1 month)

1992 The fellowship in Nancy (France) funded by the French Ministry of Science and Technology (3 months)

1990/1991 Alexander von Humboldt Fellowship in Tubingen, Germany

Education/degrees

2000 Professor (Jagiellonian University)

1991 Habilitation – DSc (Jagiellonian University)

1982 PhD (Jagiellonian University)

1977 MSc (hons) (Jagiellonian University)

Honors and awards

1984, 2008 Award of the Rector of the Jagiellonian University for scientific achievements and teaching

2004–present Membership of the Polish Academy of Sciences

2011 Award of the Rector of the Jagiellonian University for scientific achievements

Editorial Boards

2007–present Mycorrhiza

2012–present Symbiosis

2007–present Phytochemistry Review
2000–present Dendrology
2000–2010 Acta Societatis Botanicorum Poloniae

Lecturing

1995–2004	Taxonomy of fungi and algae (year 1), 30 or 15h lectures/year, Jagiellonian University, Institute of Botany
2004–present	Microbiology (year 4), 30h lectures/year, Jagiellonian University, INOŚ
1996–present	Ecology of Fungi (year 2–5), 30 h/year, Jagiellonian University
1996–present	Ecology of Mycorrhiza (year 2–5), 30 h/year, Jagiellonian University
2000–present	Biomonitoring (year 1–5) 30 hours, Jagiellonian University, INOŚ

Seminars

2000–present Student seminar (4–5 year), 60h/year, Jagiellonian University

Practicals

1982–1998 Plant and fungal taxonomy

Supervision of students:

1) PhD students: 5 completed, 2 ongoing
2) MSc students: > 23 completed, 8 ongoing

Professor Katarzyna Turnau is a microbiologist with over 30 years' research experience in plant-microbial interactions in the context of environmental significance of microbiota in plants functioning under presence of high metal content. She has been involved in several projects concerning the application of fungi, bacteria and plants in the restoration of various waste tailings (mine dumps) in Poland, Portugal, Sardinia, Austria, and Germany. Her research focuses on different types of mycorrhizal fungi which can be useful in phytoremediation. Some of her works also concern radioactivity and nanoparticles. She is the leader of Plant-Microbe Interaction Group at the Institute of Environmental Sciences of the Jagiellonian University where she is the lecturer in microbiology, bioremediation and the ecology of fungi. She is also the leader of Bioremediation Group at the Małopolska Centre of Biotechnology, at the Jagiellonian University. In addition, she is a teacher of microbiology at the Faculty of Conservation and Restoration of Artworks, Jan Matejko Academy of Fine Arts in Cracow, and she serves as a consultant in microbiology for Master students.

She has published over 100 refereed papers and several book chapters, has been involved in several EU-funded projects, was awarded a Humboldt Fellowship and was elected (in 2003) a correspondent member of the Polish Academy of Sciences. She has been involved in several journal Editorial Boards such as *Mycorrhiza*, *Phytochemistry Review*, and *Symbiosis*.

Stanisław Twardy (DSc Eng.)

Graduated from the Higher School of Agriculture (currently University of Agriculture) in Kraków: MSc in 1967, doctorate in 1977, habilitation (DSc) 1992. In 2003, he received the title of professor. He personally supervised most of the research carried out in the Carpathians area. These include studies of the low-input use of pasture and meadow sward, organization of grazing large herds of sheep, inputs and production outputs of grazing cattle achieved through utilizing cowsheds and "non-stop outdoor" systems in the mountains, effect of penning on yield and botanical and chemical composition of sward, evaluation of the effectiveness of maintenance mowing of the pasture sward, assessment of suitability of different types of fencing for grazing cattle, and finally, evaluation of the potential of mechanical milking of Polish Mountain Sheep breed, taking into account environmental, organizational, production and sanitary aspects. Currently the main research activities focus on the environmental protection, agronomy, management of permanent grasslands in submontane and mountain areas, threats to and protection of meadow habitats, soil and agricultural water resources. He participated in the development of many expert opinions, concepts and implementations. Head of numerous original research topics related to sustainable and durable development of areas of diversified relief, especially the Carpathians. He prepared many opinions and assessments, among others, within the ZPORR National Expert Framework in the scope of water supply and sewage systems. He conducted training for farmers and local administration on the Code of Good Agricultural Practice, implementation of the Nitrates Directive, as well as providing training for secondary school students on raising the ecological awareness in the upper Vistula River valley. He co-authored 3 patent applications. Supervisor of several Master's and doctoral theses. Participated in many research projects for the FAO and the EC e.g. SAFO, BIOFORUM. Recently

coordinated and/or implemented several international projects (e.g. SaLMaR, FACCE MACSUR, FINEGRASS). Director of Małopolska Research Centre in the years 1993–2016. Author or co-author of about 300 papers, articles and scientific reports, including agro-bio-technical dictionary, and several monographs. Active member of Scientific Council of the Institute of Technology and Life Sciences.

Maciej Wierzbicki (MSc Eng.)

Graduated from University of Agriculture in Kraków (MSc 2010). He specialized in horticulture – ecology and plant protection. He completed trainings in the Netherlands within Leonardo da Vinci program (Naaldwijk 2008). During his stay in Sweden (Stockholm 2011–2012), he developed recipes for tobacco products under lab conditions. In 2014–2016, he took part in various research projects within the Institute of Technology and Life Sciences, including: SaLMaR (Sustainable Land and Water Management of Reservoir Catchments), and FINE-GRASS (Effect of Climatic Changes on Grassland Growth, its Water Conditions and Biomass) focusing on environmental engineering. He possesses very good English language skills (writing and speaking), basic Swedish as well as a good knowledge of IT systems.

Marek Więckowski

Assoc. Professor.
Director of the Scientific Center of the Polish Academy of Sciences in Paris

He had worked as a professor at the Institute of Geography and Spatial Organization at the Polish Academy of Sciences in Warsaw and as a Head of the Department of Urban and Population Studies. In 2014 he was nominated as the Director of the Scientific Center of the Polish Academy of Sciences in Paris.

In the years 2002–2004, he was working in the ENS LSH in Lyon (France) as a researcher during his post-doc program (Scholarship of the French Ministry of Science). Marek Więckowski prepared his PhD thesis (University of Warsaw) on cross-border cooperation between Poland and Slovakia, and his habilitation (DSc) on tourism development in the Polish borderlands. His research interests include border studies (European integration, cross-border cooperation), tourism development, mobility aspects, accessibility to tourism destinations and self-catering accommodation. Other aspects of his research include regional development and spatial planning.

In the years 1997–2002, he was working for the Polish Television (among others, in the years 1997–2000, as a broadcaster of TV program: Polskie ABC, TVP Polonia channel; in the years 2000–2002, as a weather broadcaster for Panorama,TVP 2 channel.

In the years 2012–2014 he acted as vice-president of the Polish Geographical Society.

Since 2012 – Editor in Chief of the Geographia Polonica journal.

Marek Więckowski is the author of more than 150 articles and 50 books and textbooks (one of these received an award by the EEPG during Frankfurt International Book Fair, in the competition for the best school textbook in Europe). He was a chair of many national and international scientific projects.

Alaa Zaghloul

Email: alaazaghloul2002@yahoo.com
Website: www.freewebs.com/alaazaghloul2006/

Alaa Zaghloul is a Research Professor of Environmental Soil Chemistry, National Research Centre in Cairo, where he has been employed for more than 32 years. Following his professional experience, he is now a Vice Chairman of the National Committee for Environmental Problems in Egypt, Academy of Scientific Research and Technology (ASRT) and Member of the Standing Committee for the Promotion of Professors and Associate Professors, NRC. Dr Zaghloul received his BSc and MSc degrees from El-Azhar University in 1982 and 1994 respectively, and his PhD from of Ain Shams University (Egypt) in 1998.

He has a wide experience in chemistry of soil reactions through the kinetics of soil chemical processes; especially as relates to potential toxic elements PTEs under varied conditions such as temperature regime. In 2003 Dr Zaghloul invented an instrument called the Electrical Stirred Flow Unit (ESFU), which helps in understanding kinetic reactions under different conditions (available online).

Alaa Zaghloul's work focused on the effect of clay minerals type, iron, aluminum, and manganese oxides as well as humic substances on different reactions, which take place in the soil system. His work is also concerned with the use of kinetic approach to elucidate mechanisms of metal retention and release on clay surfaces. His works also relates to the remediation of heavy metals in contaminated soils using the application of recent and economical soil amendments available under local conditions, thus reducing the bioavailability of such pollutants under different reaction conditions. He is involved in national and international projects with the focus on the environmental pollution.

Dr Zaghloul has published over sixty professional articles, a chapter in the book in the field of soil chemistry and plant nutrition, and he has participated in many national and international congresses.

Liliana Zaharia

Professor at the University of Bucharest, Faculty of Geography

Liliana Zaharia graduated in 1986 from the Faculty of Geology and Geography of the University of Bucharest. In 2000–2002 she attended the post-graduate cycle on "Hydrology and Water Resources Management", jointly organized by EPF Lausanne, University of Neuchâtel and ETH Zürich. In 1997 she earned her Ph.D. in Geography. Since 2006 she is full Professor at the University of Bucharest, Faculty of Geography, Department of Meteorology-Hydrology, where, since 2007, she is thesis director.

Her fields of interest focus on continental hydrology, water resources management and water related risks. She published 9 books and book chapters and over a hundred articles and abstracts (17 of her papers were published in ISI rated/indexed journals). She delivered more than 150 presentations at scientific meetings and conferences. She coordinated 3 national research projects and 4 international bilateral grant projects (with France and Switzerland).

Prof. Zaharia is the director of the "Water Resources and Hydrological Risks Management" Research Center. She is a member in many professional societies and editorial boards.

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UNIWERSYTET ROLNICZY
im. Hugona Kołłątaja w Krakowie

Wydział Inżynierii Środowiska i Geodezji

Kraków, 23.01.2017 r.

Jego Magnificencja
Prof. dr hab. Włodzimierz Sady
Rektor Uniwersytetu Rolniczego
im. Hugona Kołłątaja w Krakowie

W imieniu Komitetu Organizacyjnego i swoim proszę o objęcie patronatem Warsztatów pt. "Ekologia i Nauki o Środowisku - łagodzenie i adaptacja do stresu wodnego", które planowane są w dniach 9 - 10 czerwca 2017r.

Organizowane Warsztaty są trzecią edycją spotkań, po 1'-szej edycji z marca 2012r., „Problèmes actuels de la protection contre les inondations", Paris-Orléans oraz 2'-giej edycji z listopada 2015r. „Sciences de l'Environnement", Paris-Bondy. Tą edycję warsztatów organizuje Wydział Inżynierii Środowiska i Geodezji UR w Krakowie naszego Uniwersytetu. Współorganizatorami Warsztatów są: Stowarzyszenie Inżynierów i Techników Polskich we Francji, Stacja Naukowa Polskiej Akademii Nauk w Paryżu oraz Institut de Recherche pour le Developpement we Francji.

Ponadto swoim patronatem objęli je: Polska Akademia Nauk, Ambasada Republiki Francuskiej w Warszawie, Europejska Federacja Polonijnych Stowarzyszeń Naukowo-Technicznych, Federacja Stowarzyszeń Naukowo-Technicznych NOT, Region Centrum, Marszałek Województwa Małopolskiego, Towarzystwo Rozwoju Obszarów Wiejskich.

Tematyka Warsztatów obejmuje problemy gospodarki wodnej gleby i roślin ze szczególnym uwzględnieniem warunków stresowych.

Zwracamy się do Pana Rektora z prośbą o objęcie Warsztatów swoim patronatem oraz udział w tym wydarzeniu.

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MAŁOPOLSKA

Kraków, dnia 01.02.2017 r.

znak sprawy: KZ-I.004.81.2017

Kancelaria Zarządu

Szanowni Państwo

dr hab. inż. Agnieszka Ziernicka – Wojtaszek
dr hab. inż. Leszek Książek
dr hab. inż. Jerzy Niziński
Wydział Inżynierii Środowiska i Geodezji
Uniwersytetu Rolniczego w Krakowie

Szanowni Państwo,

serdecznie dziękuję za nadesłaną korespondencję zawierającą propozycję objęcia patronatem honorowym Pana Wojciecha Kozaka - Wicemarszałka Województwa Małopolskiego, *III Warsztatów Ekologia i Nauki o Środowisku – łagodzenia i adeptacja, EcoSciance.*

Mam przyjemność poinformować, że Pan Marszałek przyjmuje przedstawioną propozycję i deklaruje objęcie przedsięwzięcia swoim patronatem. Organizowana przez Państwa inicjatywa należy do kategorii wydarzeń, które posiadają dużą wartość poznawczą, służą rozwijaniu współpracy oraz pomagają w wymianie doświadczeń. Pomysłodawcom i organizatorom życzę powodzenia w realizacji działań związanych z przygotowaniem tego interesującego wydarzenia.

W związku z udzielonym patronatem uprzejmie proszę o zamieszczenie w materiałach (zaproszeniach, folderach informacyjnych, ulotkach, plakatach itp.):

1. tekstu: „Patronat Honorowy: Wojciech Kozak - Wicemarszałek Województwa Małopolskiego",
2. nowego logo województwa małopolskiego, dostępnego na stronie internetowej Województwa Małopolskiego www.malopolska.pl/logo.

Przed terminem rozpoczęcia wydarzenia proszę o przesłanie wersji elektronicznej ww. materiałów do akceptacji na adres: patronaty@malopolska.mw.gov.pl.

W miejscu realizacji przedsięwzięcia proszę wyeksponować system identyfikacji wizualnej z symboliką Województwa (np. banery, roll-upy). Sprzęt należy z odpowiednim wyprzedzeniem zarezerwować i odebrać z siedziby Urzędu Marszałkowskiego Województwa Małopolskiego (tel 12/ 61-60-402, 12/ 61-60-403).

Z poważaniem

Dyrektor
Kancelarii Zarządu
Witold Kochan

Urząd Marszałkowski Województwa Małopolskiego
ul. Basztowa 22, 31-156 Kraków
adres do korespondencji: ul. Racławicka 56, 30-017 Kraków

AMBASSADE DE FRANCE
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POLOGNE

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L'Ambassadeur

N° 2017-104238

Madame, Messieurs,

Je vous remercie vivement pour votre courrier m'informant de la tenue de votre prochain atelier « Ecologie et Sciences de l'Environnement » à Cracovie au mois de juin, dans le cadre de la réalisation du programme de coopération du partenariat stratégique franco-polonais.

Mes meilleurs vœux de succès vous accompagnent dans cette initiative. J'ai le plaisir de vous annoncer que l'ambassade de France en Pologne accorde son patronage honoraire à cet atelier dédié à l'écologie, la climatologie, l'hydrologie, la gestion de l'eau, la science du sol, la physiologie des plantes et des sciences agricoles.

Je vous assure du soutien du service de coopération et d'action culturelle de cette ambassade et vous invite à prendre l'attache de M. Sébastien Reymond, attaché de coopération scientifique et universitaire (sebastien.reymond@diplomatie.gouv.fr).

Je vous prie d'agréer, Madame, Messieurs, l'expression de ma considération distinguée.

Pierre Lévy

Mme Agnieszka Ziernicka-Wojtaszek, Directeur de la Chaire de Climatologie
M. Leszek Książek, Vice-doyen du Département de génie de l'environnement et de géodésie
M. Jerzy Niziński, Professeur invité
M. Lucjan Sobkowiak, Président de l'Association des ingénieurs et des techniciens polonais en France
M. Marek Więckowski, Directeur de l'Académie Polonaise des Sciences de Paris
Wydział Inżenierii Środowiska i Geodezji
Uniwersytet Rolniczy im. Hugona Kołłątaja w Krakowie
al. Mickiewicza 24/28
30-059 Kraków

Copie . M. Frédéric de Touchet, Consul général de France
ul. Stolarska 15
31-043 Kraków

NACZELNA ORGANIZACJA TECHNICZNA
FEDERACJA STOWARZYSZEŃ NAUKOWO-TECHNICZNYCH

PREZES
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Szanowny Pan
Jerzy Niziński
Członek Zarządu
Stowarzyszenia Inżynierów
i Techników Polskich we Francji

Szanowny Panie Inżynierze,

Serdecznie dziękuję za propozycję objęcia przez FSNT-NOT Honorowym Patronatem warsztatów „Ekologia i Nauki o Środowisku".

W dobie gwałtownych zmian i szybkiego rozwoju cywilizacyjnego coraz większego znaczenia nabiera edukacja ekologiczna oraz szeroko rozumiana ochrona środowiska. Cieszę się, że poruszacie Państwo, ten ważny temat organizując warsztaty dotyczące ochrony środowiska. Z zadowoleniem również przyjmuję propozycję objęcia przez FSNT-NOT patronatem honorowym warsztatów „Ekologia i Nauka o Środowisku". Opublikujemy również w „Przeglądzie Technicznym" komunikat o Warsztatach.

Gratuluję wspaniałego jubileuszu 100-lecia Stowarzyszenia Inżynierów i Techników Polskich we Francji. Mam nadzieję, iż uda mi się uczestniczyć w głównych obchodach 100-lecia Stowarzyszenia oraz spotkać na nich Koleżanki i Kolegów z Francji. Wszystkim uczestnikom konferencji życzę sukcesów oraz powodzenia w kreowaniu i wdrażaniu innowacyjnych technologii i rozwiązań mających pozytywny wpływ na ochronę środowiska naturalnego, które w czasach gwałtownego postępu technicznego jest zagrożone.

Z wyrazami

Warszawa, 1 lutego 2017 r.

00-043 Warszawa, ul. Czackiego 3/5; tel. 22 336-12-51, fax 22 336 14 60,
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