AGRICULTURE USES
70%
OF WATER WORLDWIDE

DRINKING WATER **8%**
INDUSTRIAL USE **22%**

71%
EARTH'S SURFACE
COVERED BY WATER

2,5%
FRESHWATER
MAINLY LOCKED IN ICE
AND IN THE GROUND

ONLY **1%**
READILY AVAILABLE
FRESHWATER

COLLECTING WATER FROM ROOFS OF BUILDINGS

URBAN ZONE

SUBURB ZONE

ARABLE ZONE

BORDER OF THE CITY AND ARABLE FIELDS

RAINWATER COLLECTION SYSTEM

AUTOMATIC IRRIGATION SYSTEM

STORAGE URBAN TANK

THE WATER IS PURIFIED BEFORE
IT IS SENT TO THE FIELDS

IRRIGATION PIPE

STORED WATER IN URBAN TANK IS TRANSPORTED TO TANKS
FOR IRRIGATION OF FIELDS LOCATED UNDER THE TOWN

REUSE PURIFIED WATER

Country / City	Poland
University / School	Kielce University of Technology
Academic year	2017-2018
Title of the project	Improvement of rainwater retention on arable lands in Świętokrzyskie province - drought in agricultural areas
Authors	Karolina Huk, Lidia Jańczy, Alicja Stefańska, Klaudia Zygmunt

10

PERFORMATIVE NATURE

Barcelona International Landscape Architecture Biennial

September 2018 Barcelona

SCHOOL PRIZE

X International Landscape Architecture Biennial

Máster d'Arquitectura del Paisatge -DUOT - UPC
ETSAB- Escola Tècnica Superior
d'Arquitectura de Barcelona
Avenida Diagonal, 649 piso 5
08028 Barcelona-Spain

TECHNICAL DOSSIER

Title of the project	Improvement of rainwater retention on arable lands in Świętokrzyskie province - drought in agricultural areas
Authors	Karolina Huk, Lidia Jańczy, Alicja Stefańska, Klaudia Zygmunt
Title of the course	Master of Architecture
Academic year	2107-2018
Teaching Staff	Magdalena Wojnowska - Heciak
Department/Section/Program of belonging	
University/School	Kielce University of Technology

Written statement, short description of the project in English, no more than 250 words

The project refers to the drought problem on arable areas in świętokrzyskie province in Poland, occurred as a result of inadequate land management in 70'ties (creating large scale farmlands, land draining and elimination of midfield natural reservoirs) and climate change. The analysis shows that agricultural areas predominate in Poland, therefore it is crucial to eliminate problems related to that economy sector. Research on drought occurrence based on 2017 data, proves that świętokrzyskie province is among other regions in Poland the most endangered with water scarcity. Four separate plots of different topography and location are selected for detailed study. The aim of the project is to improve water management and develop water disposing methods in drainage systems and also its appropriate use for irrigating agricultural fields. Due to the permutations in precipitation over years (climate change consequences) , all types of water storage systems should be introduced and evaporation should be reduced. Proposed solutions focus on natural midfield reservoirs restoration, reducing rain water outflow, rainwater surplus transport and storage into the specially designed village tanks, creating special soil layers facilitating water retention, appropriate systems for the fields use reducing evaporation, crops' type change for plants with less water demand. These methods could be applied not only in this particular province but also as a general concept of water management approach in Poland.

For further information
Máster d'Arquitectura del Paisatge -DUOT - UPC

T: + 34 93 401 64 11 / +34 93 552 0842
Contact via email at: biennal.paisatge@upc.edu
Consult the web page http://landscape.coac.net/

POLISH LANDSCAPE

HEL PENINSULA

WARMIA AND MAZURY

WISŁA - THE LONGEST RIVER

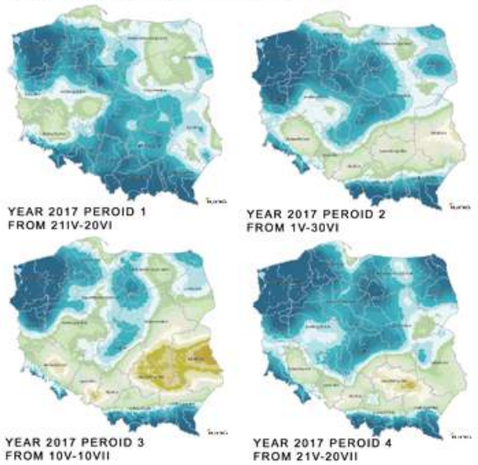
WARSAW - THE CAPITAL OF POLAND

AGRICULTURAL LANDSCAPE

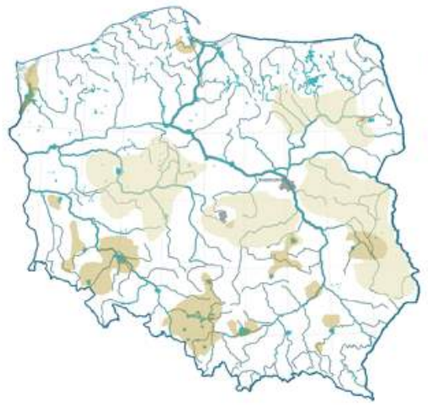
TATRY MOUNTAINS

ELMINATION OF DROUGHT

CLIMATIC WATER BALANCE TIME PERIOD FROM APRIL TO JULY



WATER SHORTAGE IN POLAND

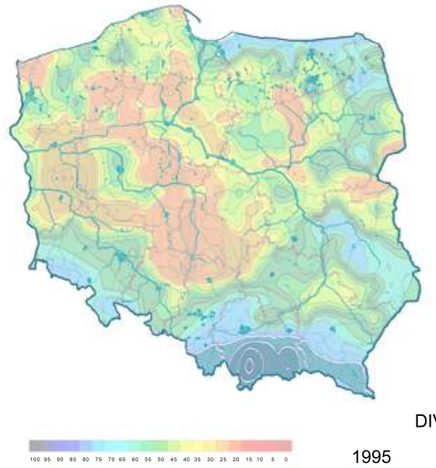


AREAS THREATENED BY WATER DEFICIT FOR
- AGRICULTURE
- INDUSTRY AND MUNICIPAL UTILITY

LAND USE IN POLAND

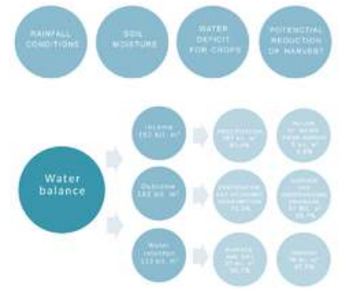
AREAS THREATENED BY WATER DEFICIT FOR
- ARABLE LAND
- ORCHARDS
- MEADOWS AND PASTURES
- FORESTS
- URBAN DEVELOPMENT ABOVE 100 000 INHATABITANTS

SOIL MOISTURE INDEX



CLIMATIC WATER BALANCE IS THE DIFFERENCE BETWEEN THE SUM OF ATMOSPHERIC PRECIPITATION AND THE AMOUNT OF EVAPORATION

MONITORING OF DEFICITS AND EXCESS OF WATER IN GRICULTURAL ECOSYSTEMS AND THEIR EFFECTS IN CARRIED OUT USING THE INDEX METHOD:



AGRICULTURAL AREAS IN ŚWIĘTOKRZYSKIE VOIVODESHIP

LOCATION ON THE POLISH MAP

ONE OF 16 VOIVODESHIP

AREA 11 710.50 KM²

1,25 MILLION PEOPLE

IN 2013, 3.5 MILLION TOURISTS VISITED IT

THE OLDEST MOUNTAINS

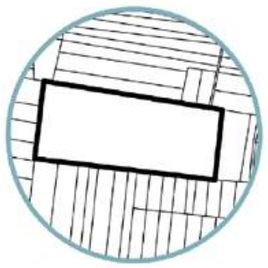
1 NATIONAL PARK
9 LANDSCAPE PARKS
11 AREAS OF PROTECTED LANDSCAPE
701 NATURAL MONUMENTS
8 NATURE AND LANDSCAPE COMPLEXES
83 ECOLOGICAL ARABLE LAND

15 RUINS OF CASTLES

INDUSTRIAL NORTH AND AGRICULTURAL SOUTH

SUBURBAN AGRICULTURAL PLOT

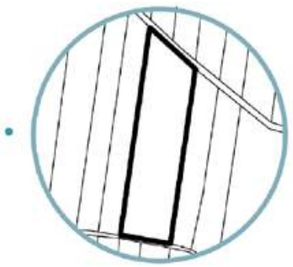
AGRICULTURAL PLOT IN THE LANDSCAPE



AGRICULTURAL PLOT BY THE RIVER

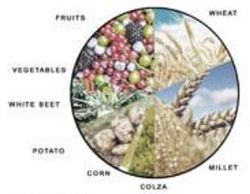
AREAS OF PARTICULAR HANDICAPS IN AGRICULTURE
VERY POOR AGRICULTURAL CONDITIONS
BAD AGRICULTURAL CONDITIONS
GOOD AGRICULTURAL CONDITIONS
LARGER COMPLEXES OF ECONOMIC FORESTS

AGRICULTURAL PLOT ON A HILL

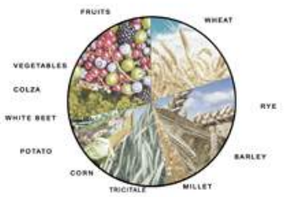


DIVISION OF CROPS

1995



2017



SITUATION 1:
STATE BEFORE THE INTRODUCTION OF PGR IN POLAND

SITUATION 2:
STATE AFTER INTRODUCING PGR IN POLAND

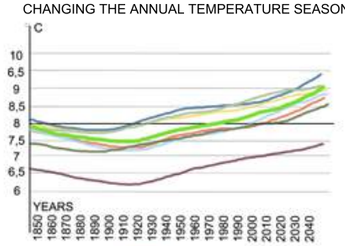
AVERAGE ANNUAL AIR TEMPERATURE WITHIN THE DECADES

Division of days in a year:

- frosty and very cold days days with a maximum daily temperature of ≤ 0 ° C
- days with a maximum temperature of ≤ -10 ° C

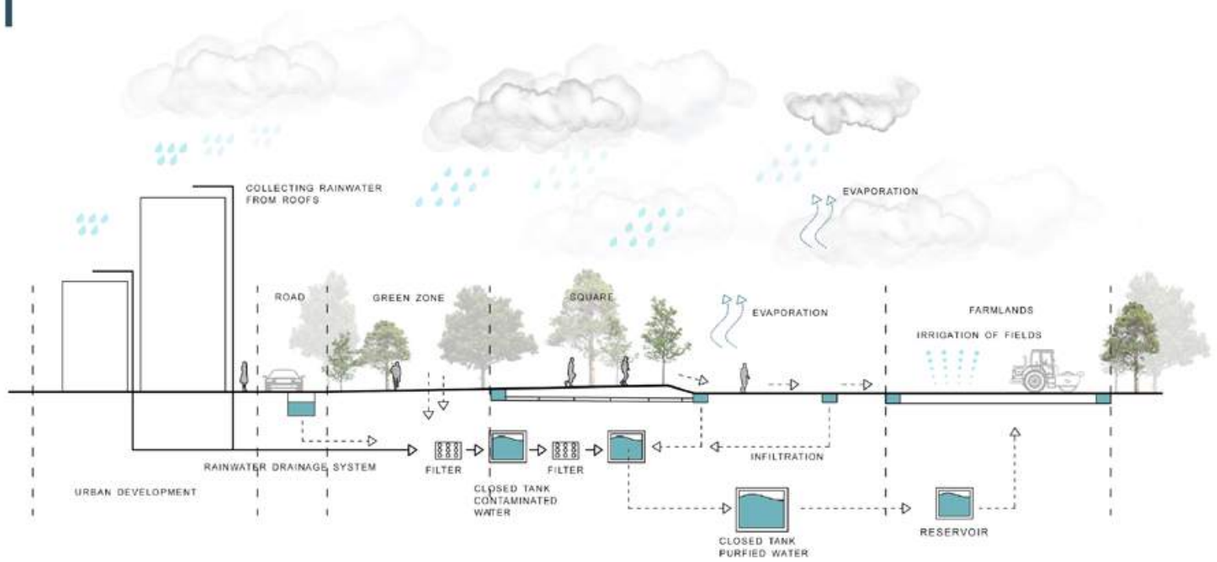
Slight increases in the number of frosty days were marked only
in mountins areas and in the south-western part of poland.

CHANGING THE ANNUAL TEMPERATURE SEASONAL WITHIN THE DECADE

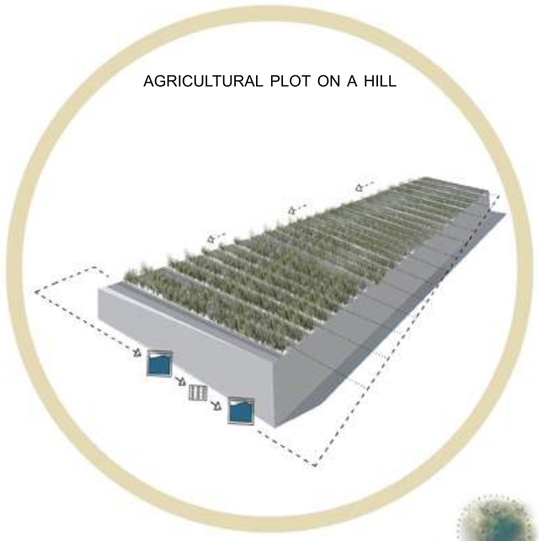


Kielce

- significant rainfall
- the average annual temperature is 7.0 ° C
- the average annual rainfall temperature is 629 mm
- the coldest month - January the average temperature - 5,8 ° C
- the hottest month - July the average temperature - 17.3 ° C



AGRICULTURAL PLOT ON A HILL



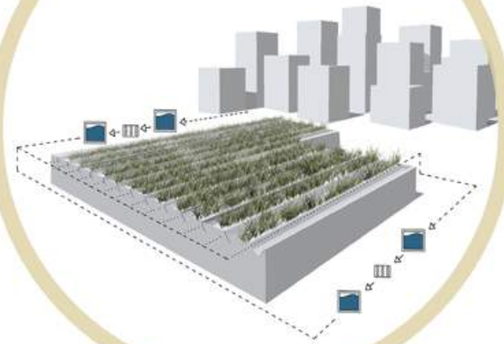
CORRECT WATER CIRCULATION IN THE ENVIRONMENT

REDUCTION OF SOIL EROSION

LARGE PROFITS FROM THE HARVEST

UNDULATING AGRICULTURAL AREAS

SUBURBAN AGRICULTURAL PLOT



REUSING WATER FROM THE VIEWER FOR AN INCREASED AMOUNT OF RAINFALL

DRAINAGE OF WATER TO THE TREATMENT PLANT

REUSE OF WATER IN HOUSING ESTATES

ARABLE FIELDS NEAR THE CITIES OF ŚWIĘTOKRZYSKIE

source: www.swietokrzyskiewloczegi.blogspot.com

source: www.swietokrzyskiewloczegi.blogspot.com

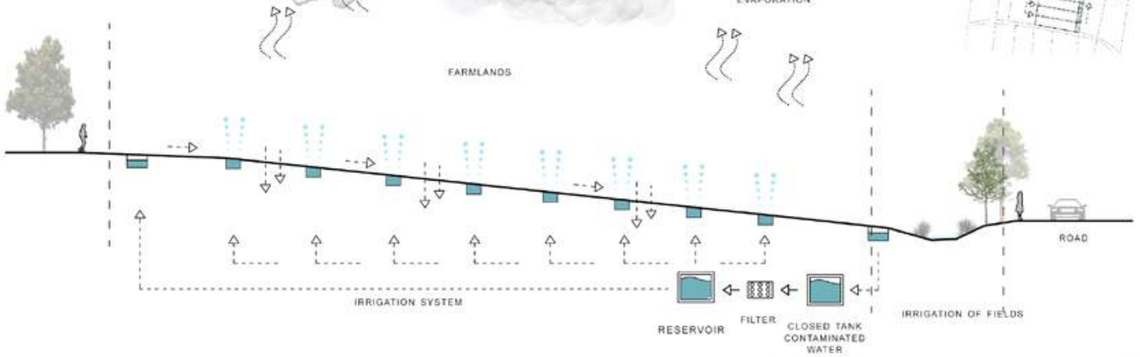
source: www.pinterest.com

SELECTION OF SUITABLE SPECIES AND VARIETIES OF DROUGHT RESISTANT PLANTS:

SHORTER GROWING SEASON

LESS WATER NEEDS

DEEPER ROOT SYSTEM LIMITING TRANSPIRATION WITHOUT THE LIMITATION OF PHOTOSYNTHESIS

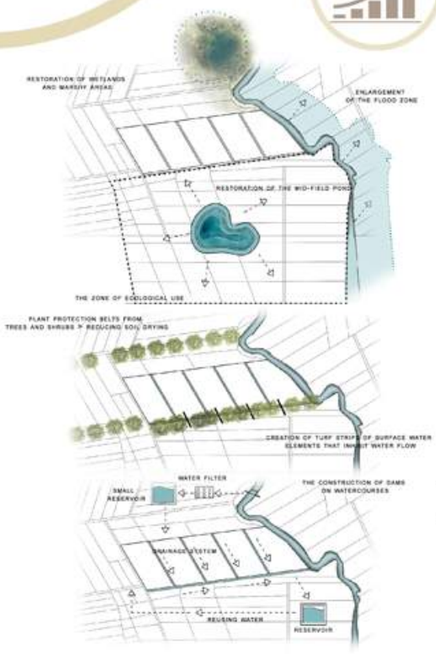


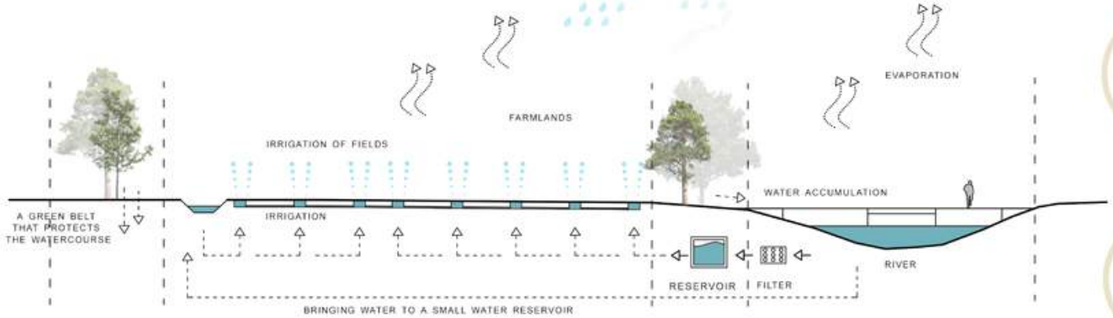
FARMLAND ON THE RIVERS

source: www.ostrow.com

source: www.jeziaszalen.pl

source: www.youtube.com



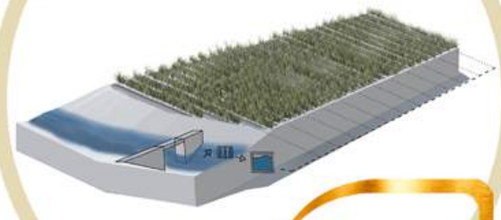


SUSTAINABLE WATER MANAGEMENT

VARIETY OF FAUNA AND FLORA

LONG-TERM EFFECTS

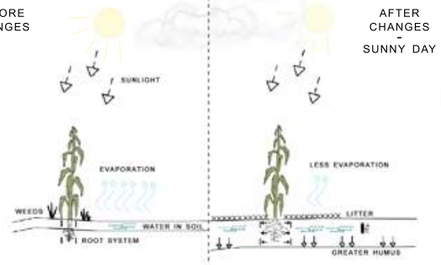
AGRICULTURAL PLOT BY THE RIVER



10

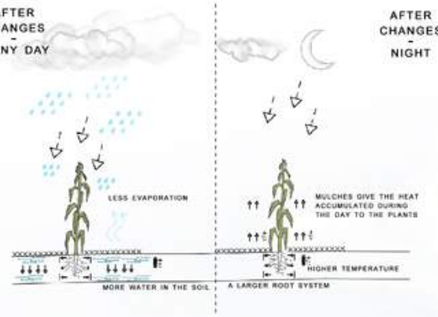
BEFORE CHANGES

AFTER CHANGES - SUNNY DAY



AFTER CHANGES - RAINY DAY

AFTER CHANGES - NIGHT

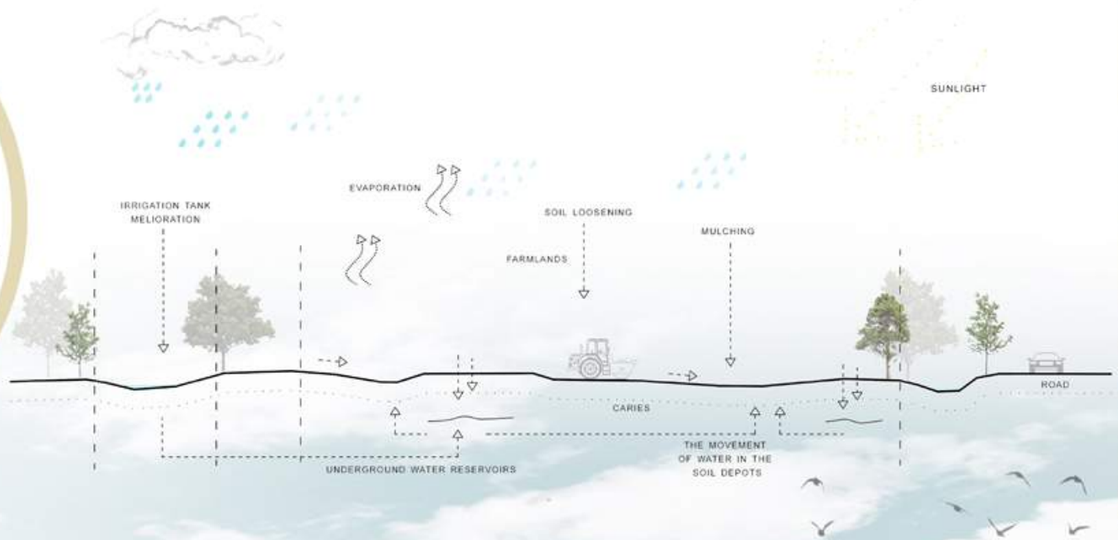


ADAPTATION TO CLIMATE CHANGE

A LARGER HARVEST

LESS WATER CONSUMPTION

AGRICULTURAL PLOT IN THE LANDSCAPE



LARGE TRACTS OF ARABLE LAND