



DIÁLOGOS TÉCNICOS DE LA XXI CODIA

Calidad, Gestión, Recuperación y Reúso de Aguas Urbanas

CATEDRA UNESCO DE AGUAS URBANAS PELA
UNIVERSIDAD DE SAN PABLO – ESCUELA DE
ENGENHARÍA – EESC - USP



Prof. José Galizia Tundisi

tundisi@iie.com.br

June 25th, 2020

www.iie.com.br

Madrid, Spain



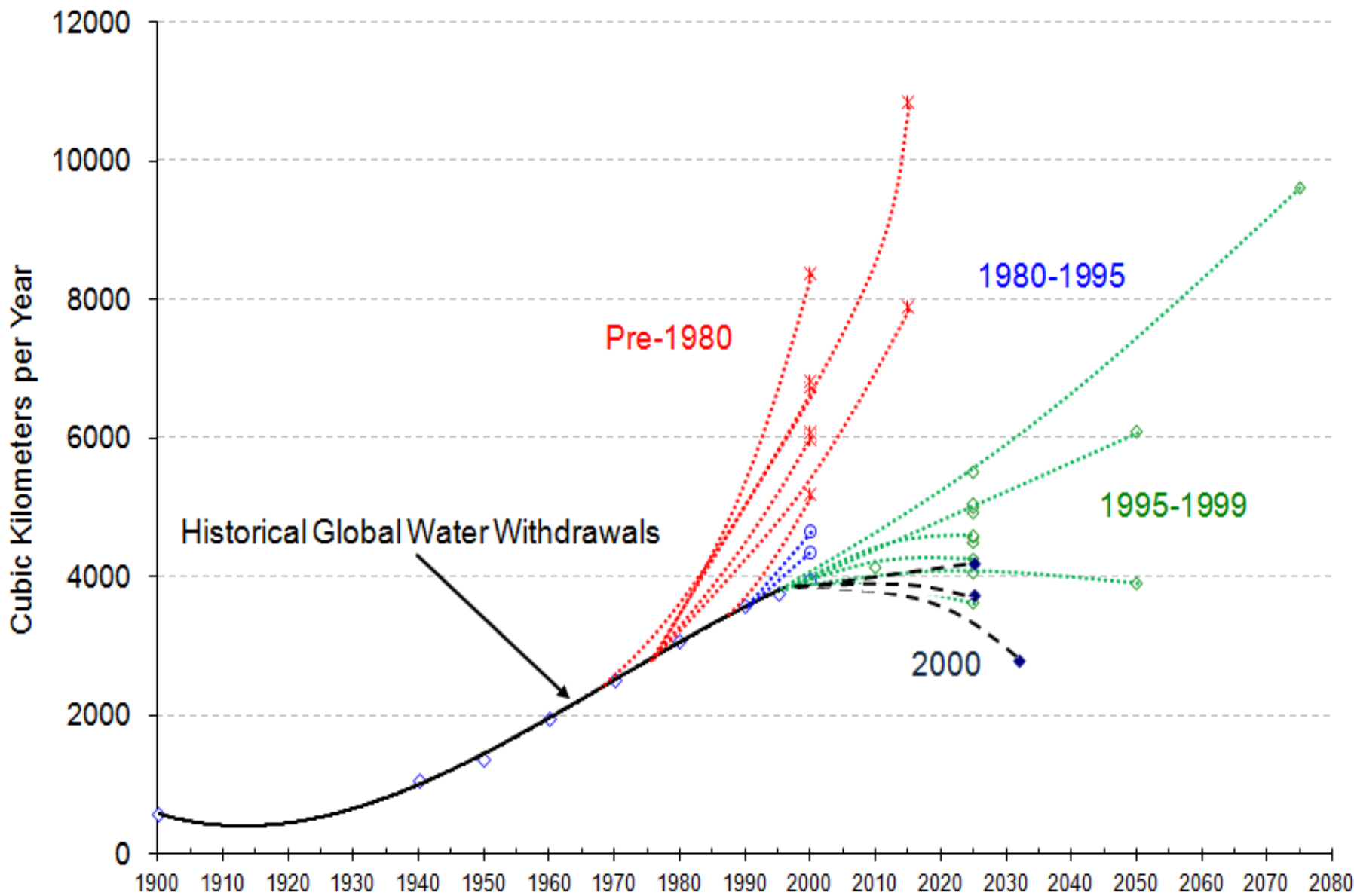
XXVII CIMEIRA
IBERO-AMERICANA
ANDORRA 2020



Red Iberoamericana
Rede Ibero-Americana



WATER QUANTITY

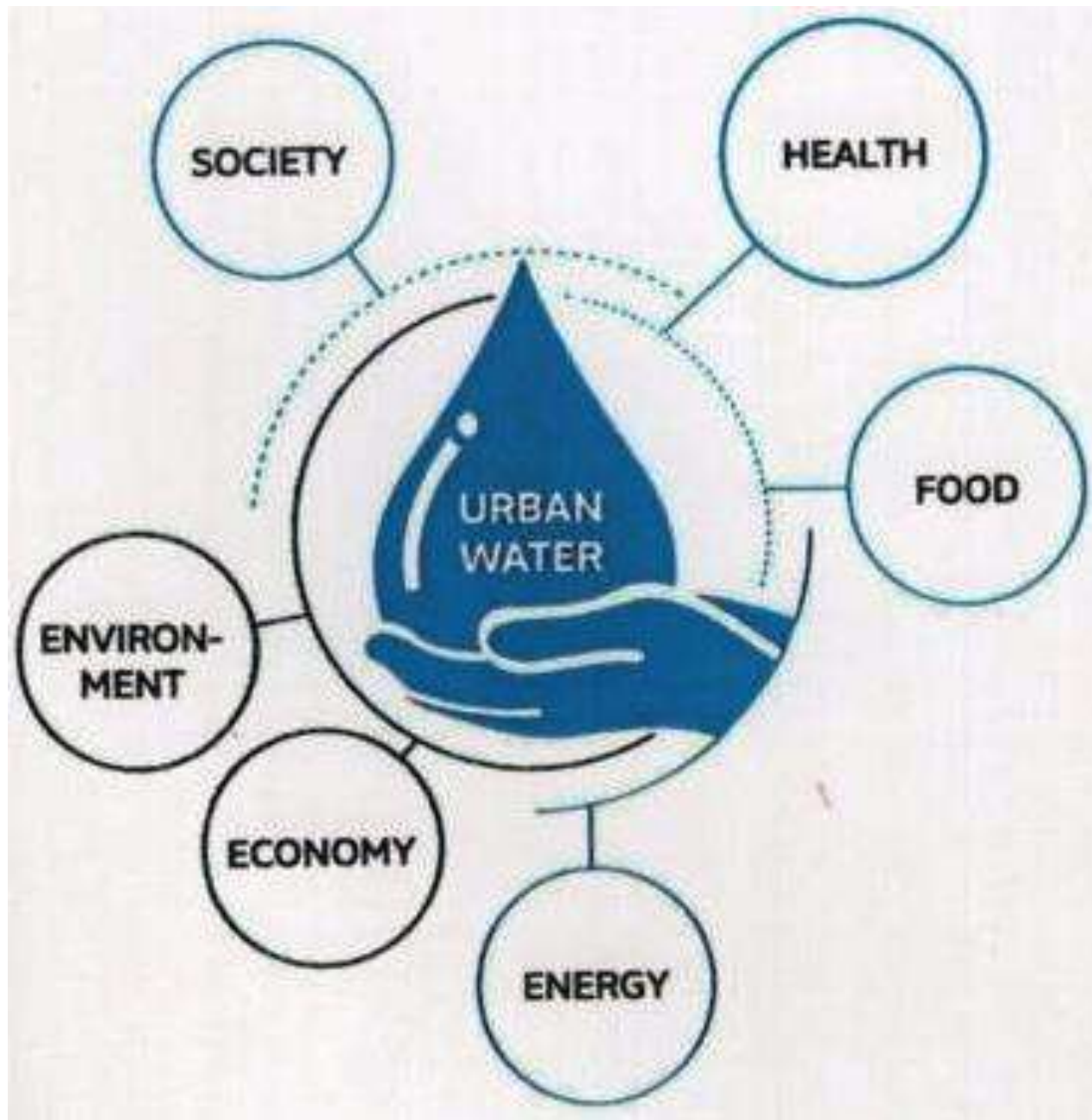


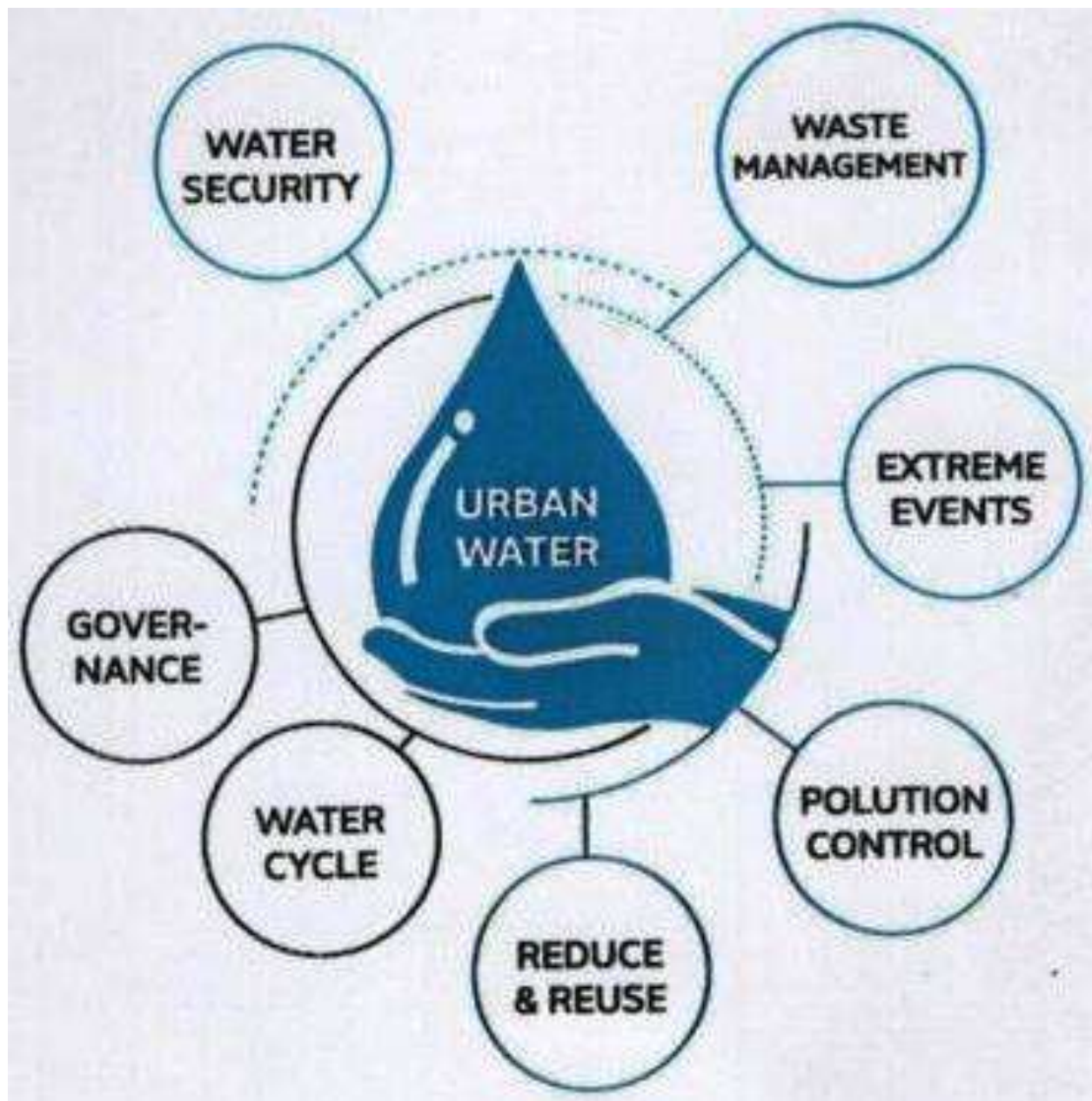
Water balance by continent (surface water).

Continent	Precipitation (km ³ /year)	Evaporation (km ³ /year)	Drainage * (km ³ /year)
Europe	8.290	5.320	2.970
Asia	32.200	18.100	14.100
Africa	22.300	17.700	4.600
North America	18.300	10.100	8.180
South America	28.400	16.200	12.200
Australia / Oceania	7.080	4.570	2.510
Antarctica	2.310	0	2.310
Total area of the continents	118.880	71.990	46.870

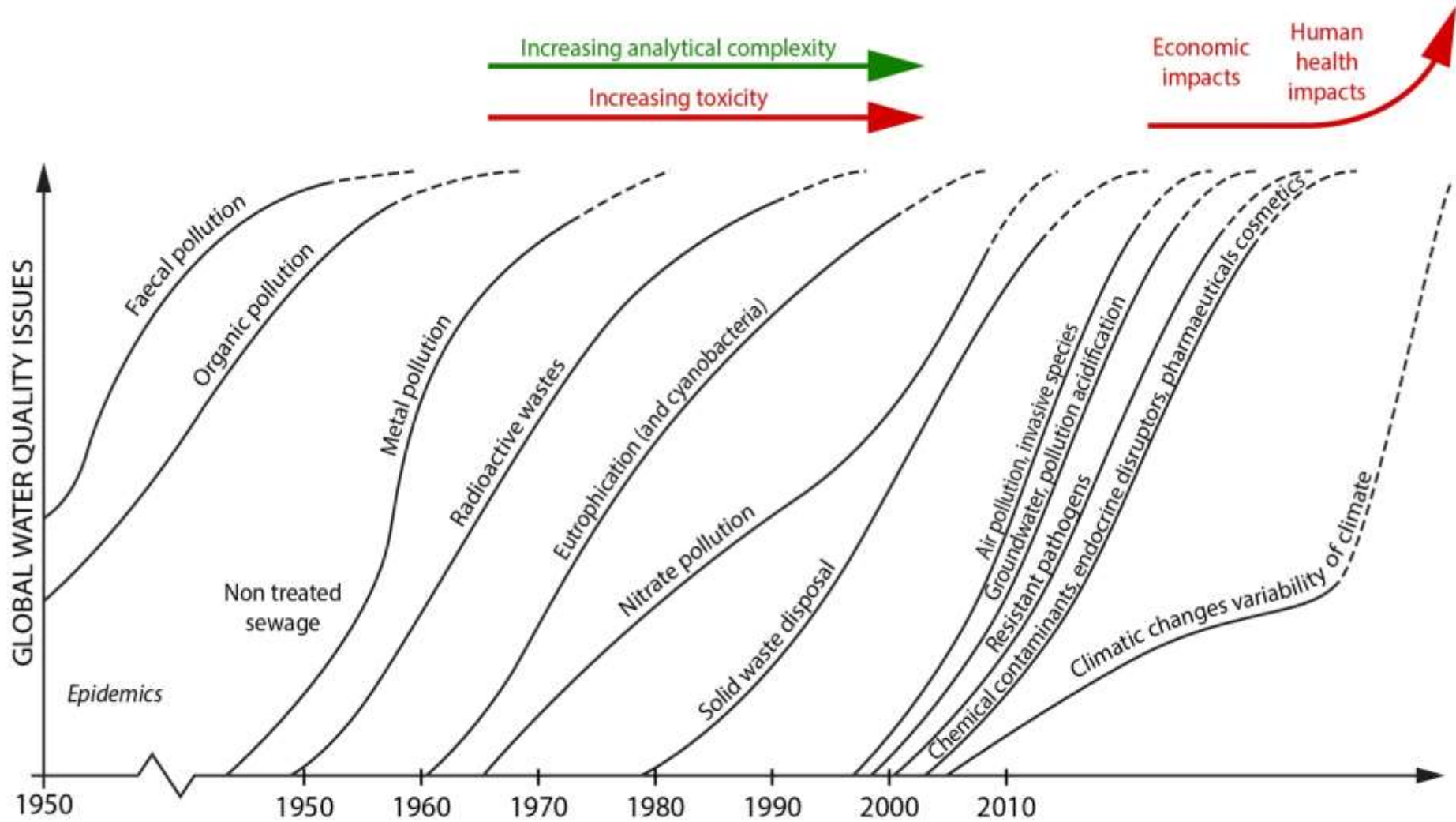
SOURCE: Shiklomanov, 1993.

* Includes drainage flows into the groundwater basins and continental ice flows in Antarctica





WATER QUALITY



Trends in water quality in the evolution of water quality problems in industrialized countries. In emerging economies the sequence is more complex. Modified from Chapman (1992) and Somlyódy and Varis (2006).

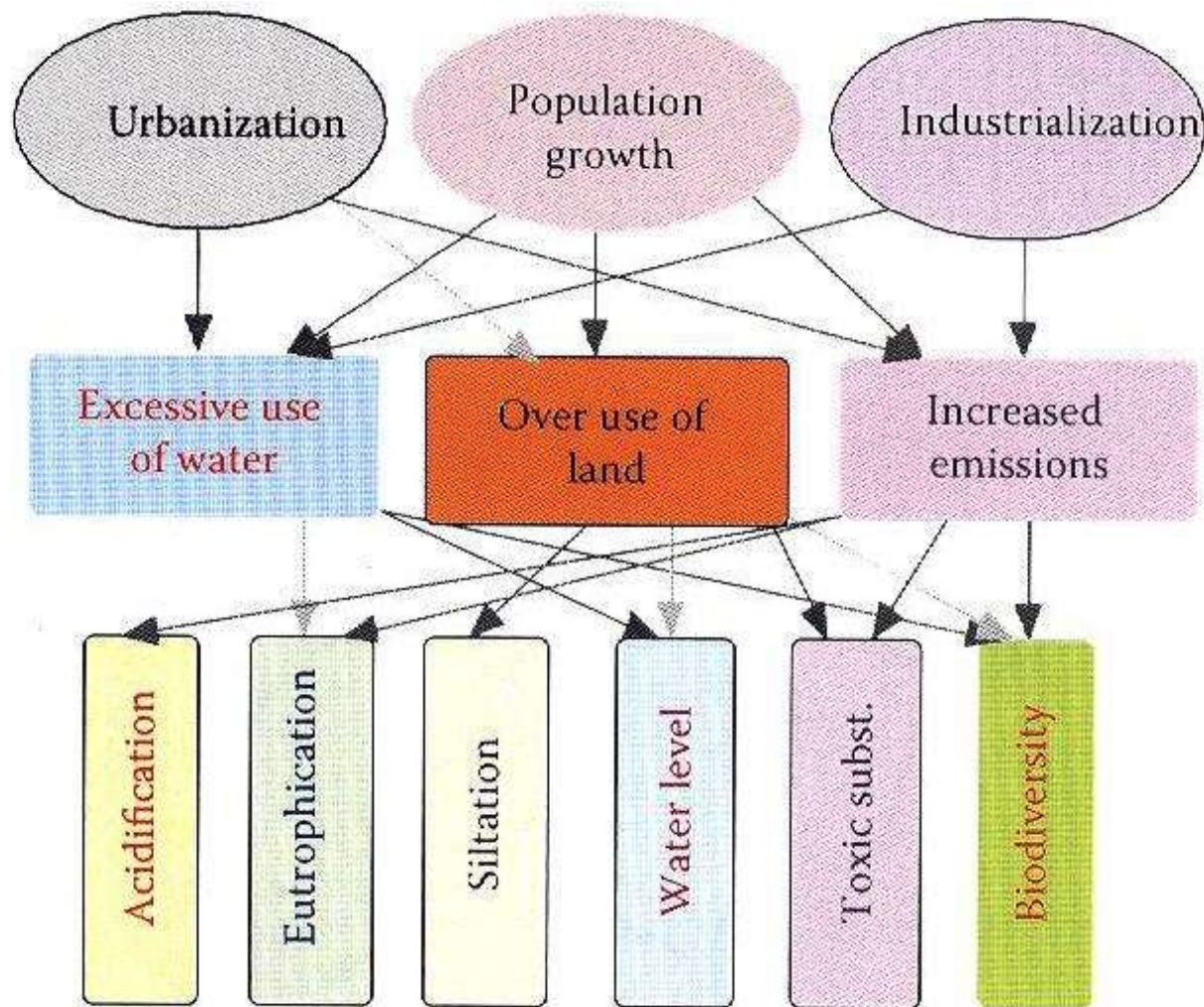


FIGURE 13.2

ILEC has formulated six problems for lakes, rivers, and reservoirs, which are due to an excessive water use, overuse of land, and increased emissions. The problems are as shown in the figure rooted in the increased urbanization, population growth, and industrialization.

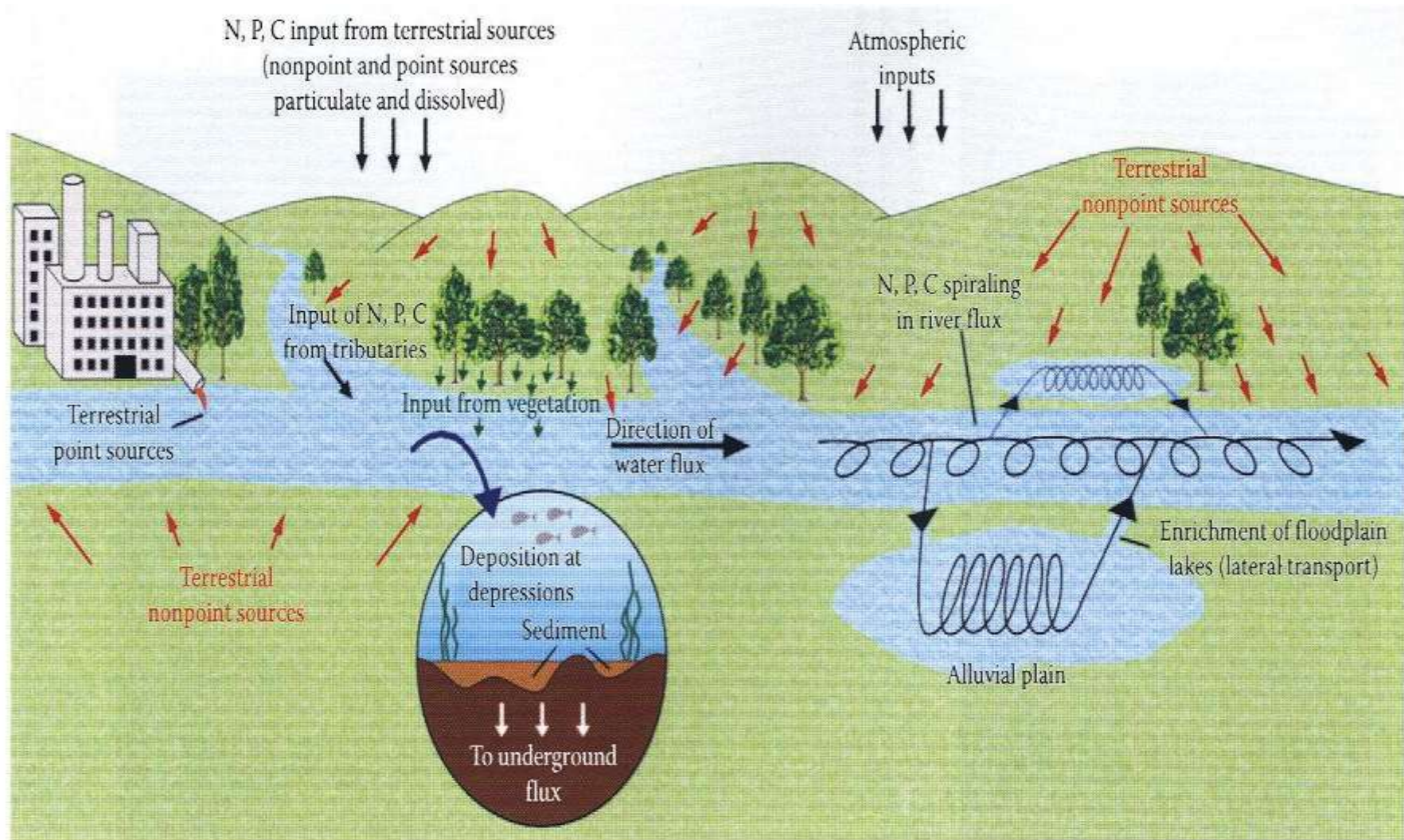


FIGURE 4.2 Sources of point and nonpoint inputs of nutrients and organic matter to the river; N, P, C spirals in river and floodplain lakes. (Credit to Degani and Tundisi, 2011.)

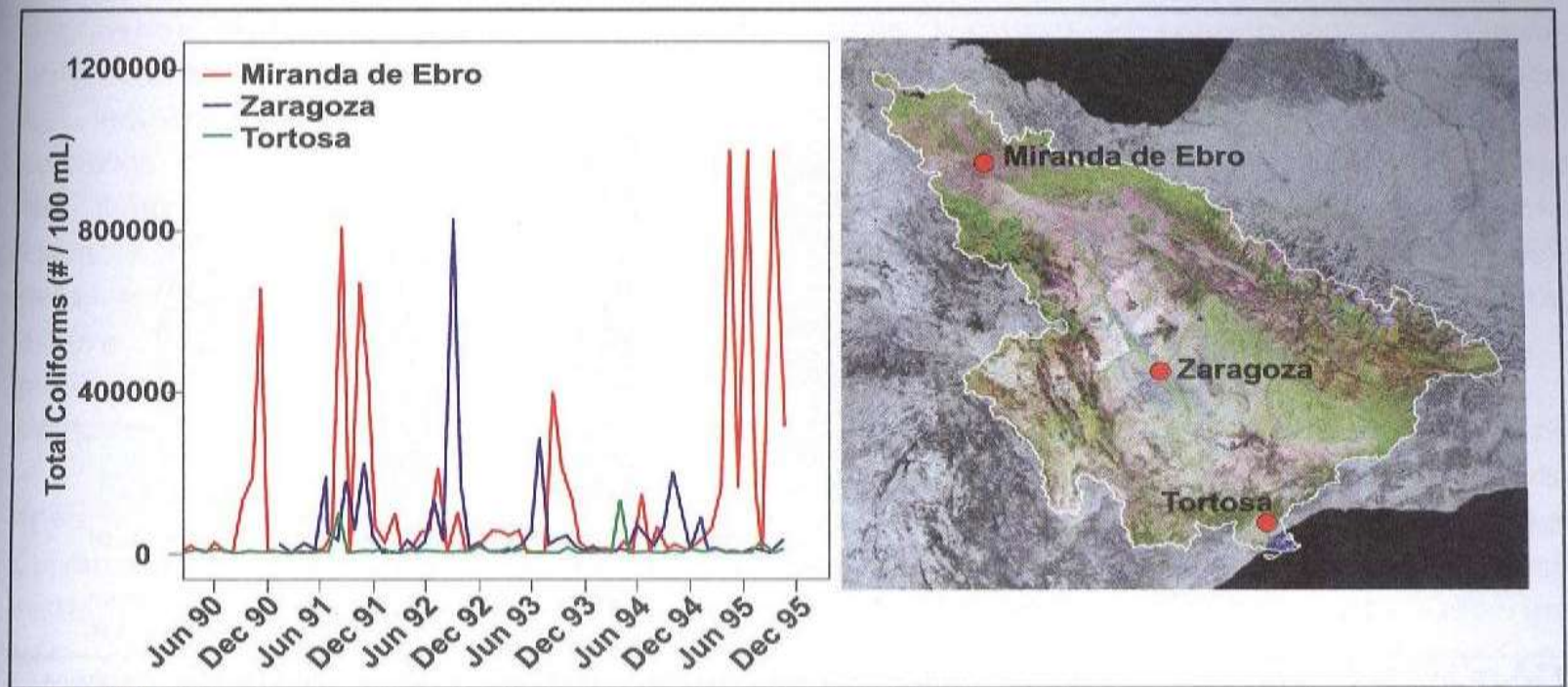


Figure 37. Total coliform concentrations at three monitoring stations in the Ebro River, Spain, measured during the early 1990s.

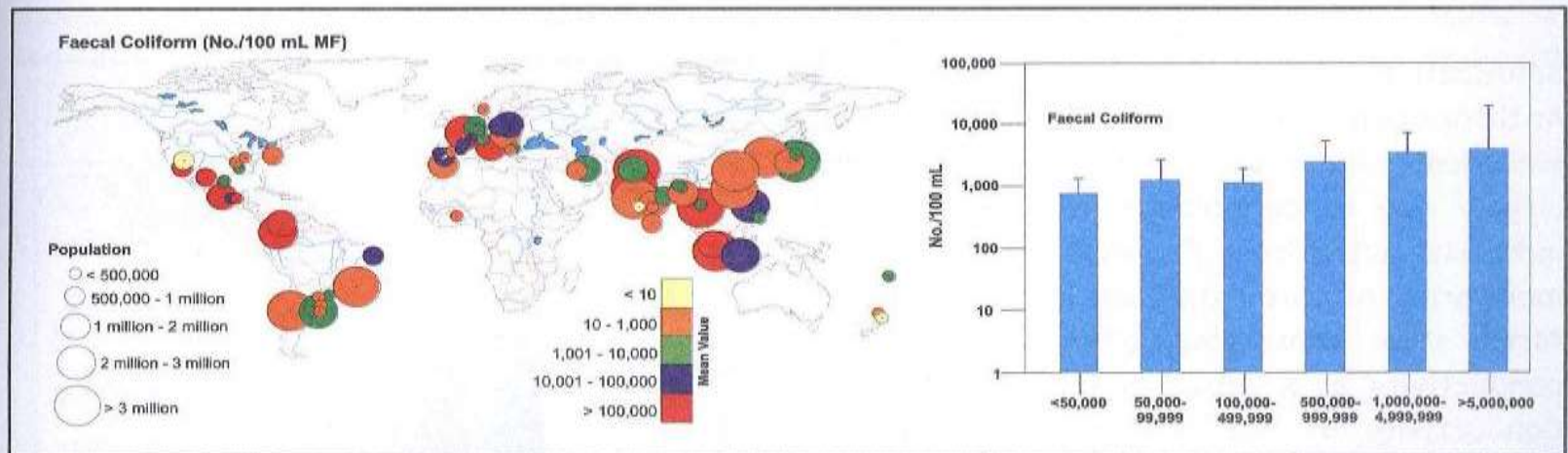


Figure 38. Faecal coliform concentrations in river monitoring stations located near to major cities, plotted according to population size (top figure). Bottom figure shows mean (± 1 standard error) faecal coliform concentrations separated by population size class of nearby cities.

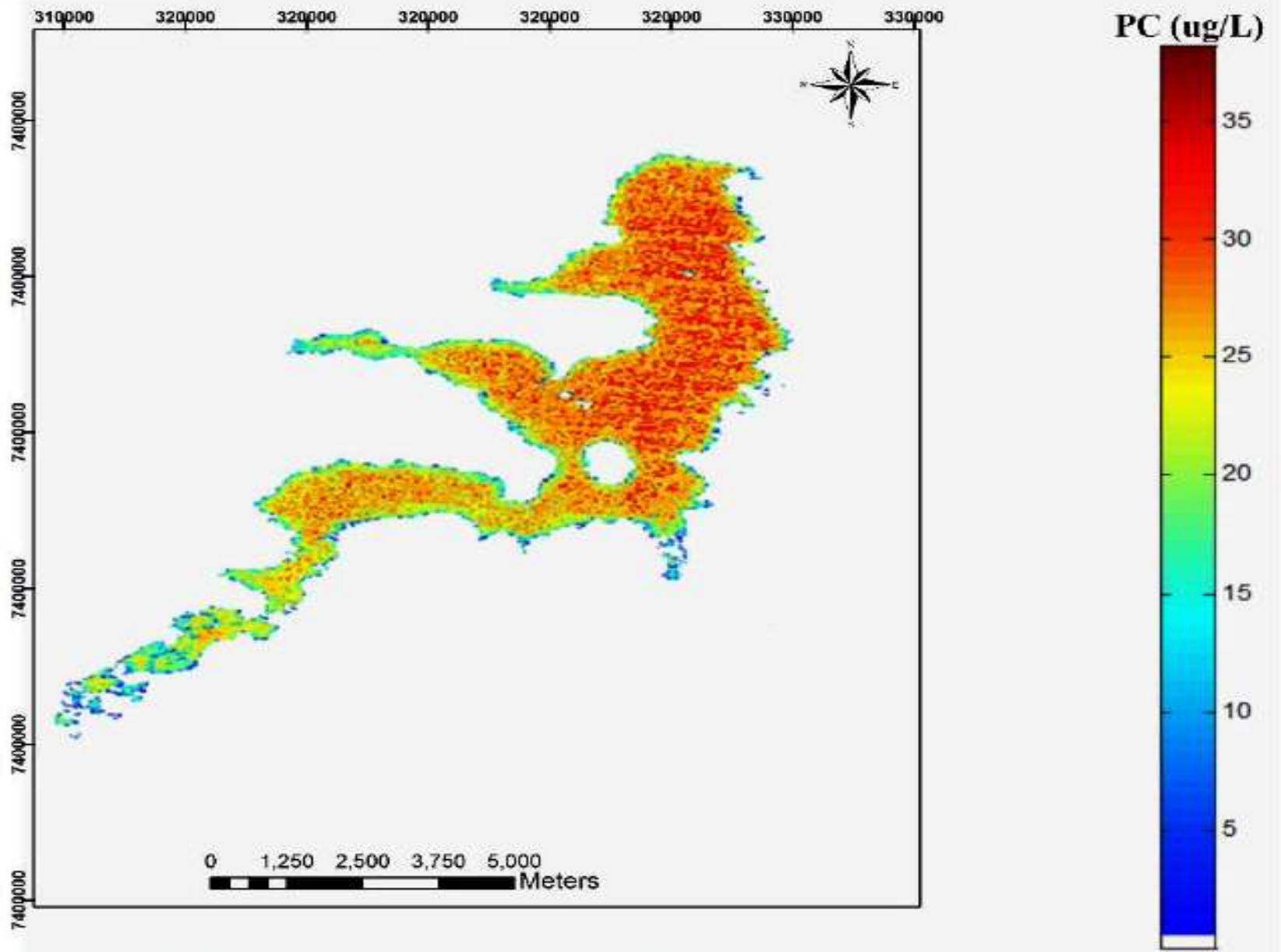
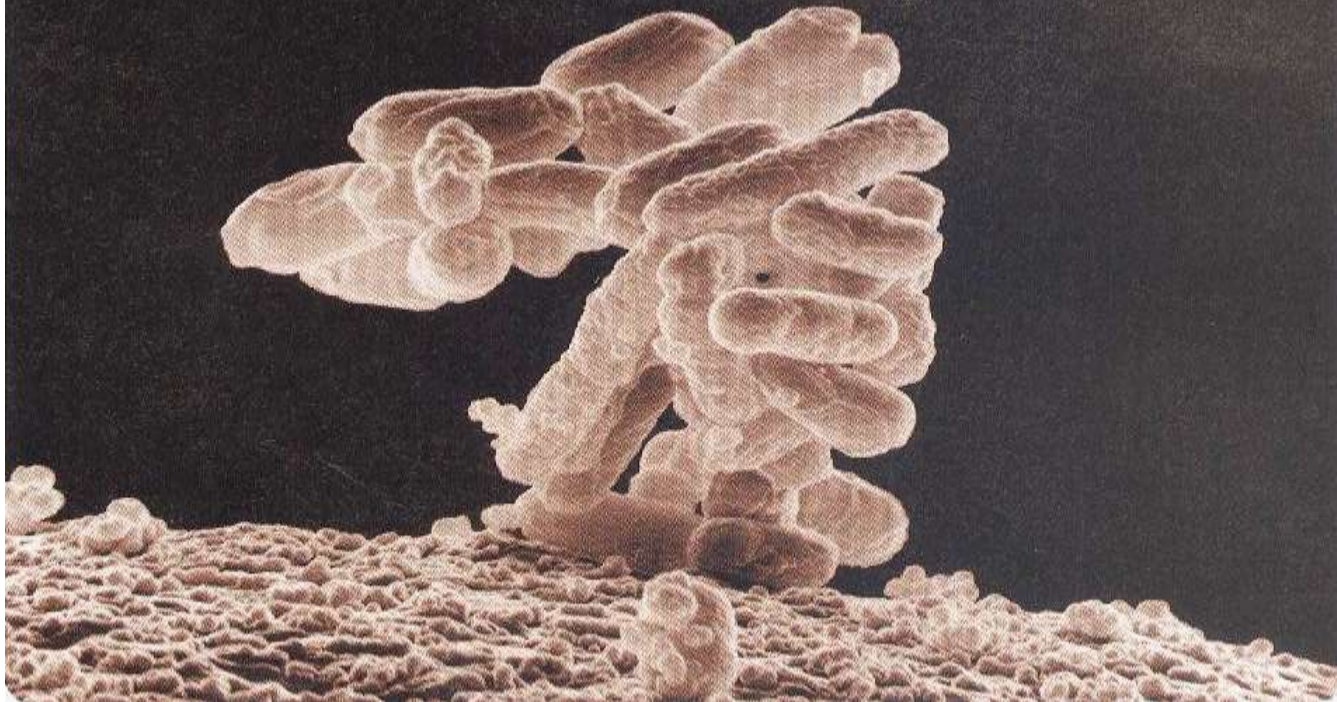


Figure 4. PC quantification from the application of the empirical algorithm in the remote sensing data.

Recalcitrant Resistance

The increased use of antibiotics is resulting in a rise of antibiotic-resistant bacteria, and wastewater treatment plants (WWTPs) that employ biological remediation processes may provide a breeding ground for them as trace amounts of antibiotics arrive in the waste stream. Su *et al.* examined over 1000 *Escherichia coli* isolates collected from various treatment steps at two WWTPs in Guangdong Province, South China. At least 98% of the isolates were resistant to 1 of 12 screened antibiotics in either plant, and over 90% were resistant to at least three antibiotics. Plasmid-mediated quinolone resistance genes and an ampicillin resistance gene (*ampC*)—both common in clinical isolates—were found in ~43% of the isolates. Disinfection steps in the plants, including UV treatment and chlorination, reduced overall bacterial abundance; however, the percentage of antibiotic-resistant bacteria (and presence of plasmid-mediated resistance genes) was higher in effluent after various biological treatment steps. WWTPs can therefore serve as a reservoir and distribution center of antibiotic-resistant genes and bacteria. —NW

Environ. Sci. Processes Impacts 10.1039/c3em00555k (2014).



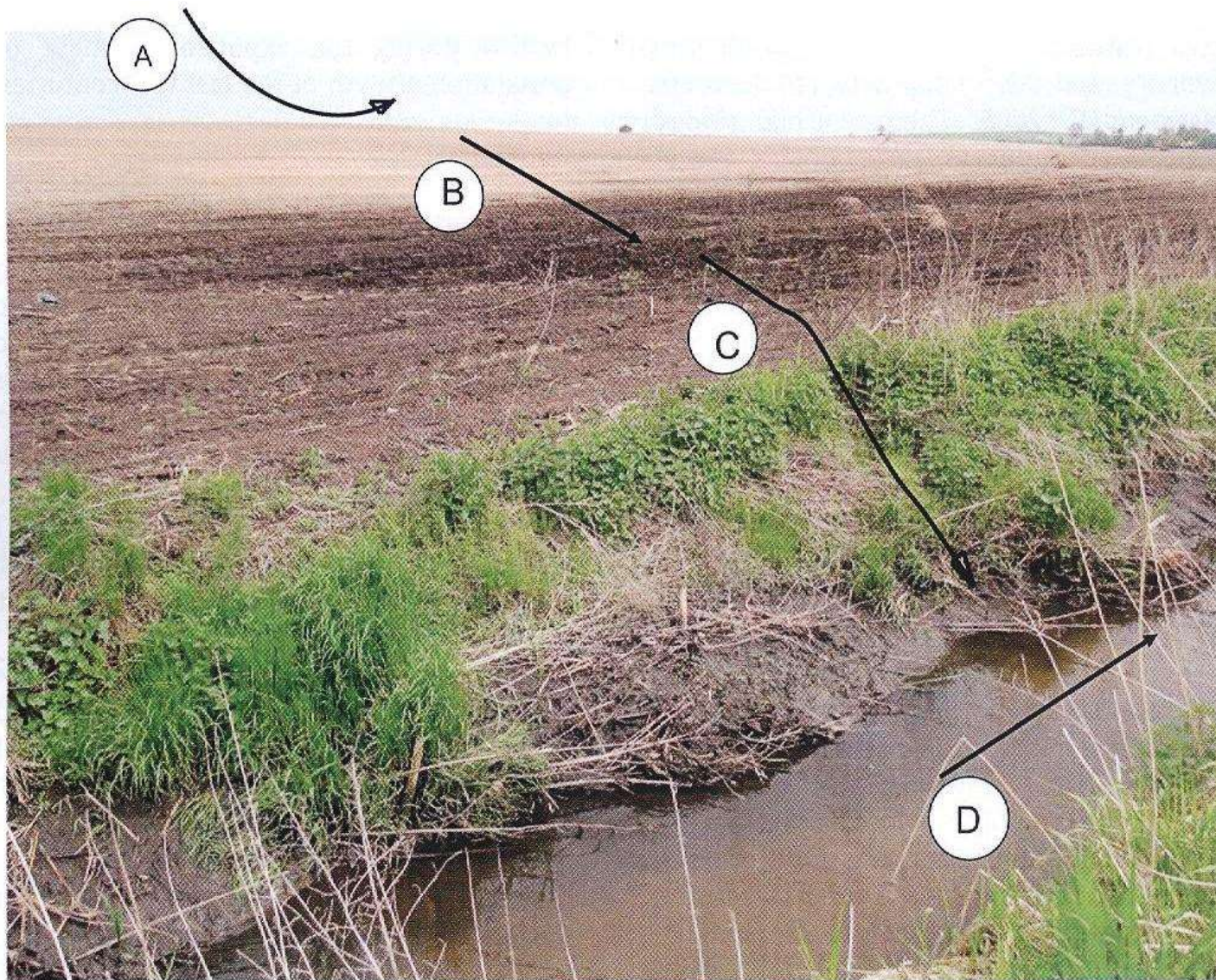


Fig. 1. The loss of organic matter and nutrients from a completely agricultural landscape, with degraded land-water ecotones (Central Poland – Pilica River Catchment). (A) Loss of organic/mineral matter and fertilizers (OMMF) owing to wind erosion; (B) transfer of OMMF down the slope due to uniformity of the landscape; (C) transfer of OMMF through the degraded land-water ecotone into the river; (D) transfer of OMMF along the river continuum to reservoirs, marine coastal zones and deep sea sediments.

Conceptual scheme of a riparian forest and its dynamic interactions with aquatic systems in a watershed

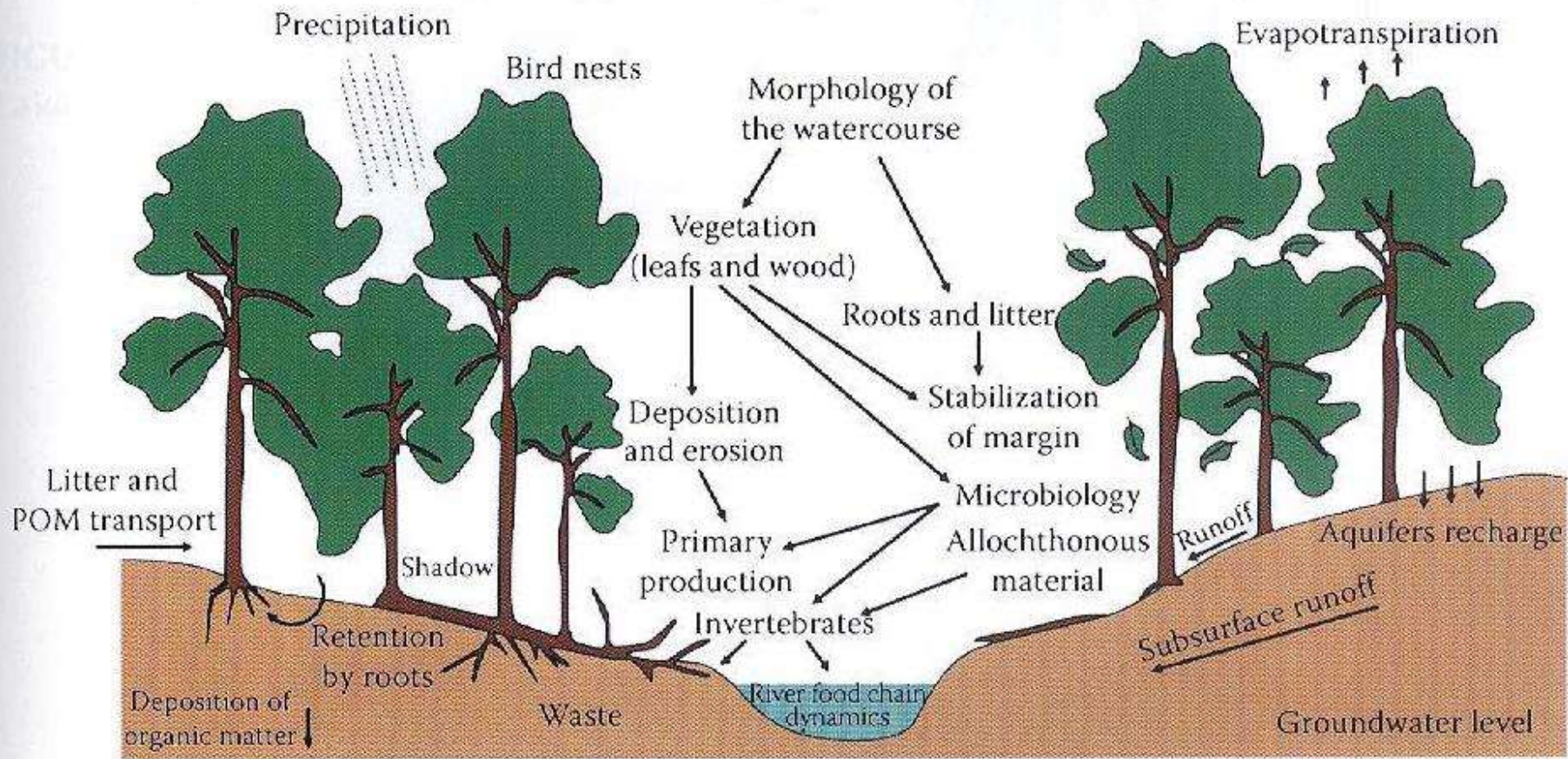


FIGURE 2.3

Role of riparian forest as a control and regulating factor in a watershed. (Modified from Likens, G.E., *The ecosystem approach: Its use and abuse*, in: Kinne, O. (Series Ed.), *Excellence in Ecology*, Ecology Institute, Oldendorf/Luke, Germany, 166pp., 1992; Paula Lima, W. and Zakia, M.J.B., *Hidrobiologia de Matas Ciliares*, in: Rodrigues, R.R. and Leitão Filho, H. (Eds.), *Matas Ciliares: Conservação e recuperação*, EDUSP, FAPESP, São Paulo, Brazil, pp. 33–44, 320pp., 2001.)

RIPARIAN FORESTS







O uso de áreas alagadas na região Metropolitana de São Paulo (como exemplo, foto da área alagada do Parelheiros/RMSP), pode resolver inúmeros problemas de gestão de bacias hidrográficas; Área alagada da represa UHE Carlos Botelho (Lobo/Broa) que funciona como um sistema controlador do influxo de nutrientes e metais pesados para esta represa.

J. G. Tundisi

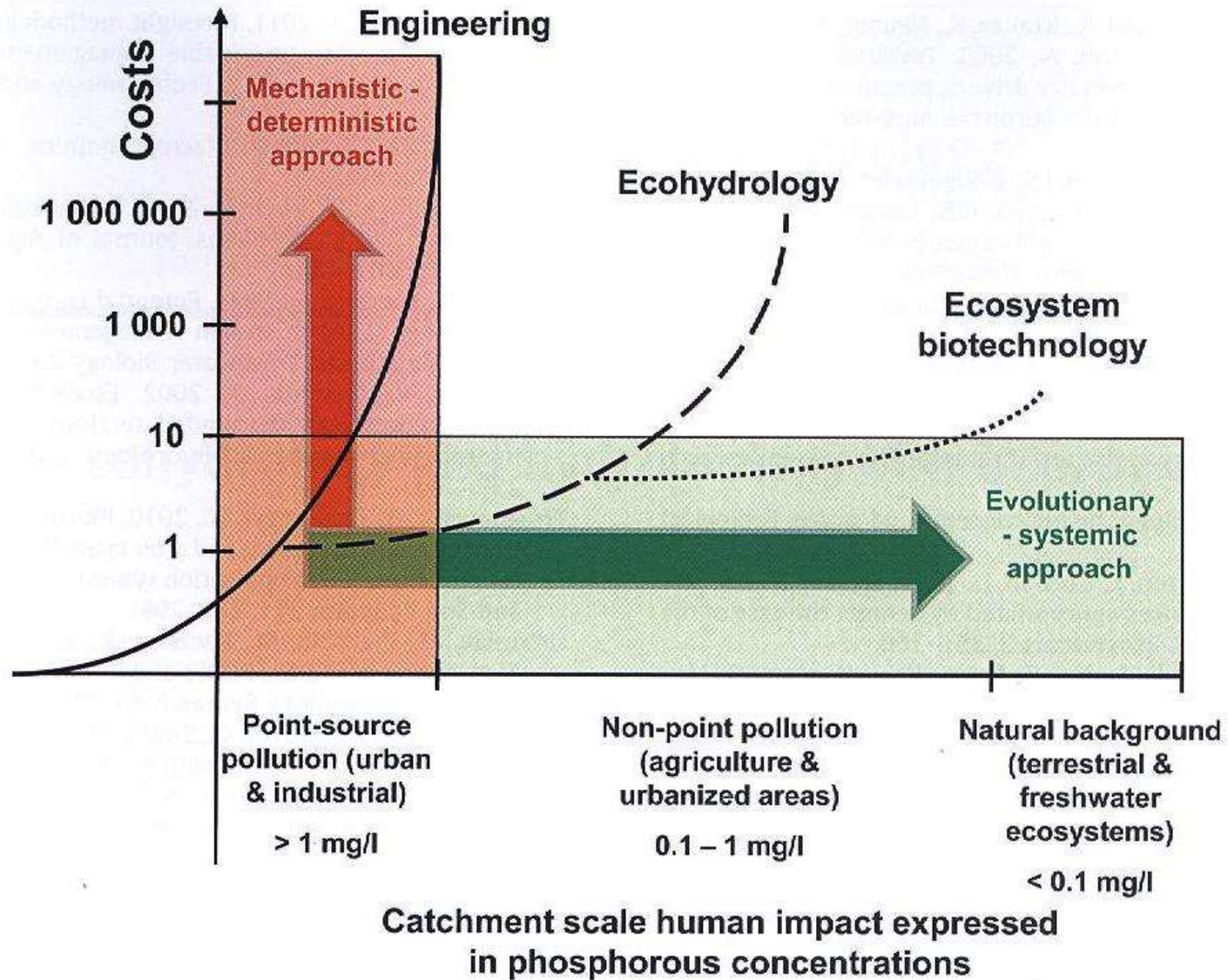


Fig. 3. Increase of efficiency and reduction of costs (IWRM) by integration of engineering, ecohydrology and ecosystem biotechnology.

Research Needs

- Keep track of all material flows (air, water, soil);
- Water quality and human health;
- Research on persistent organic pollutants and impacts on the human health and on the biodiversity;

Research Needs

- Research on resistant pathogens;
- Land/soil use and water quality;
- Interactive worldwide laboratories;

WATER GOVERNANCE

EL MUNDO NO LLEVA CAMINO DE ALCANZAR LAS METAS

- Miles de millones de personas aún carecen de servicios de abastecimiento de agua, saneamiento y lavado de manos en condiciones de seguridad;
- Se observa un aumento de la contaminación del agua;
- El agua y el saneamiento carecen de financiación;

EL MUNDO NO LLEVA CAMINO DE ALCANZAR LAS METAS

- La estructuras de gobernanza son deficientes y están fragmentadas;
- La agricultura somete los recursos hídricos a una enorme tensión, aunque podría formar parte de una solución de ahorro de agua;
- La capacidad es insuficiente;
- Los ecosistemas y sus servicios sufren un deterioro constante;

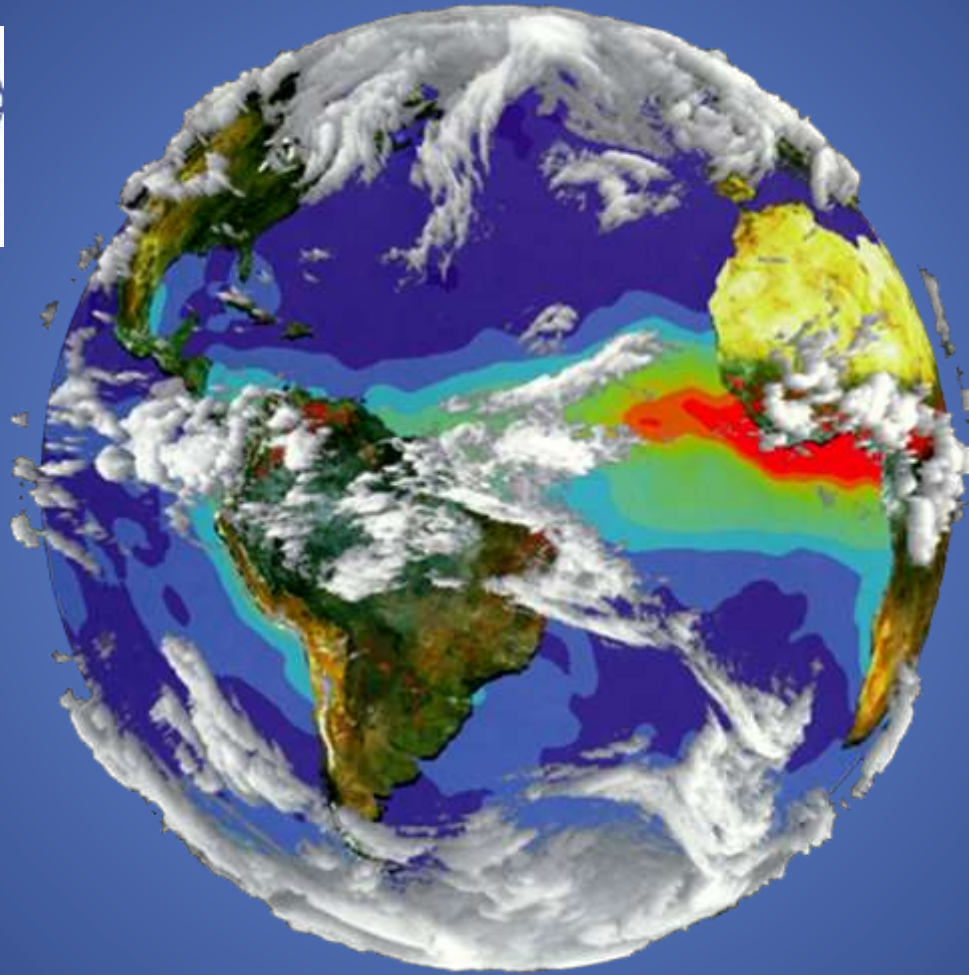
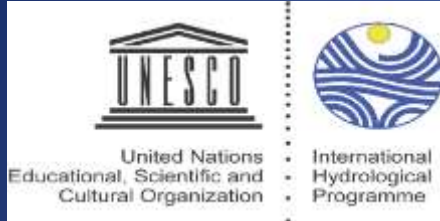
URBAN WATER MANAGEMENT: ACTION AREAS

- Urban Forestry;
- Stormwater Management;
- Urban Regeneration and Water Management;
- The food-energy-water nexus;

URBAN WATER MANAGEMENT: ACTION AREAS

- Water bio-based solutions;
- Public health and Environment Protection;
- Urban Big Data;
- Water Environmental Challenges;
- Recovery of Degraded Urban Ecosystems;

THANK YOU!



José Galizia Tundisi
tundisi@iie.com.br
www.iie.com.br
Rua Bento Carlos, 750
Centro – São Carlos – SP.

