

UNIVERSITY OF PENNSYLVANIA

SCHOOL OF ARTS AND SCIENCES

DEPARTMENT OF EARTH & ENVIRONMENTAL SCIENCE

COLLEGE OF LIBERAL AND PROFESSIONAL STUDIES



ENVIRONMENTAL POLICY ABSTRACTS

RAISING PUBLIC AWARENESS ABOUT MUNICIPAL SOLID WASTE SORTING IN KAZAKHSTAN

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Readers:

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Joseph Lisa, US Environmental Protection Agency

The problem of waste generation is one of the most relevant in Kazakhstan. By 2014 the country accumulated more than 100 million tons of municipal solid waste, which were disposed of in landfills without pre-sorting or any treatments. Today, almost all landfills in Kazakhstan do not meet ecological and sanitary requirements and are already over capacity. In order to solve the existing problems with generated municipal solid waste, the Government of Kazakhstan started to gradually introduce municipal solid waste separation in select cities in July 2016 by installing recycling bins and investing money in waste infrastructure. However, the problem with these activities is that there is little attention given to the role citizens have in the process of municipal solid waste sorting.

This project focused on raising public awareness in Kazakhstan in regards to municipal solid waste sorting and encouraging citizens to be involved in the process of separating municipal solid waste. In-depth interviews with local government representatives in Kazakhstan and the United States were conducted to study the practices of municipal solid waste management at the municipal level in both countries. This project also includes a comprehensive literature review of case studies of OECD countries with well-established municipal solid waste management practices, namely: Germany, Netherlands, and Switzerland. This project reviewed existing information that relates to the separation of municipal solid waste in Kazakhstan, gathered appropriate and applicable practices and strategies from around world in search for those that could best guide Kazakhstan's transition to a more streamlined process of separation and collection of municipal solid waste, and finally, suggest recommendations on how to increase awareness and educational attainment of the citizens of Kazakhstan regarding the necessity for separate collection of municipal solid waste.

LAND PRESERVATION, REGULATION AND RESTORATION OF RIPARIAN FOREST BUFFERS: PROMOTING THE ENVIRONMENTAL HEALTH OF WATERSHEDS IN THE MID-ATLANTIC REGION

Robyn Leto (2017)

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The inevitable connection between land and water resources highlights the importance of land use planning, best management practices and regulations and restoration to protect riparian forest buffers to promote water source protection and water quality management. The development of forested land along streams and other water sources as well as agricultural activities destroy natural riparian buffers that once trapped and filtered nonpoint source pollution before reaching waterways. Studies have shown that more forest cover in a watershed results in better water quality and lower drinking water treatment costs. A comprehensive plan for source water protection should be created for important watersheds including assessing threats to drinking water, mapping high-priority land for protection, riparian buffer protection and restoration and enactment of stormwater regulations and zoning that protect riparian buffers.

This paper explored: (1) the literature on the ecological importance of maintaining forest cover and riparian buffers in watersheds as well as state and local initiatives designed to protect water quality of watersheds and drinking water sources including the recently adopted Delaware River Watershed Initiative; (2) state and local efforts in effect that ensure riparian buffer protection; (3) stormwater regulations and best management practices in various states including Maryland where many counties adopted 100-foot setbacks from streams, rivers and lakes; (4) riparian buffer restoration programs; and (5) case studies where conservation easements are created as a means to restrict conversion of forested buffers. The comprehensive management plan developed on behalf of the New Jersey Pinelands Commission was examined to determine the effectiveness of land preservation in protecting water sources in the Pinelands. This study also examined the strategies and progress of protecting riparian buffers in the Chesapeake Bay Watershed. Local watersheds must assess whether land preservation, regulation or restoration is the appropriate strategy for their watershed.

FOOD WASTE TO ENERGY PROGRAMS: RECOMMENDATIONS FOR IMPLEMENTATION

Christine Vasko (2017)

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Food waste is a big problem, not just in the U.S., but globally. This paper gives a comprehensive background on the facts and figures surrounding food waste, and the associated environmental, economic, and social impacts. There are many different actions that can be taken to reduce food waste, and this study explores those actions and their benefits. Primarily though, this research looks at existing programs in the U.S. and Europe that currently use food waste as feedstock at wastewater treatment facilities in a process called anaerobic digestion. A valuable by-product of anaerobic digestion is biogas, which can be used to make energy that can then be used to power the wastewater treatment plant or even sold back to the grid. These programs are called food waste-to-energy programs. Conclusions are then drawn about what other wastewater treatment facilities or cities in the U.S. can do to implement similar programs. The following three questions were addressed:

1. What are the factors that make a food waste-to-energy program at a wastewater treatment facility successful?
2. What steps can be taken for other wastewater treatment facilities or cities in the U.S. to implement a successful food waste-to-energy program, and what should be avoided?
3. What are the major hurdles that need to be overcome when implementing this type of program?

Using food waste as feedstock in anaerobic digestion at wastewater treatment plants takes an environmental, social, and economic problem and turns it into a sustainable solution that would benefit the U.S. through more widespread implementation.

THE PLAN FOR THE VALLEYS: ASSESSING IAN McHARG'S VISION 50 YEARS LATER

George Hundt, Jr. (2016)

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Development pressures threatening northwestern Baltimore County, Maryland in the early 1960s led to the creation of a citizens group, the Valleys Planning Council (VPC), which in turn commissioned University of Pennsylvania Professors David Wallace and Ian McHarg to produce a land-use study. The *Plan for the Valleys* (1964) positively influenced land preservation and planning in this rural area and beyond. *The PFV* largely reflected McHarg's philosophy regarding ecological determinism. The arc of his career is addressed in the context of *The Plan*. This Capstone examines the region's vulnerabilities which necessitated *The PFV*, its visionary elements, and its long-term impacts. Focus is given to the political difficulties of implementation, and to the ancillary roles of an urban growth boundary, downzoning, and conservation easements. The partnership between the VPC and County planners was effective, but resists broader application at the same scale. *The PFV*, in fact, was only partially implemented. While it functioned as a catalyst for the extensive preservation of the countryside, significant design elements were omitted. The related failure to adopt a transfer of development rights program has contributed to a shortage of affordable housing in Baltimore County by limiting a differentiated built environment.

THE IMPACT OF DEFORESTATION: A CASE STUDY OF THE NIGER DELTA REGION, NIGERIA

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The Niger Delta region of Nigeria is blessed with freshwater swamp forest, which was once one of the richest ecosystems in the world. This ecosystem, through its diversity of species plays a vital role at local and global levels by providing economic growth, employment, and food security. It also shapes the environment and influences local climate conditions. However, this coastal vegetation has been faced with huge environmental problems resulting from an alarming rate of deforestation (from uncontrolled logging, agriculture activities, mining activities, and exploitation), and other exploration activities. These excessive environmental degradation activities have over the years taken on a dimension which is endemic in the Niger Delta due to the lack of adequate environmental education, legislation and law enforcement. The environmental impacts from these activities bring about disease, poverty, hunger and impoverishment as these natural resources are not being used in a sustainable manner.

This report examined the environmental impacts of deforestation; and the environmental management enforcement strategies with respect to the Niger Delta Region. The focus is on the environmental impacts and control of deforestation as it affects the Delta Region with a view to offering sustainable solutions. This report provides sustainable proactive and corrective solutions to the economic, social, and environmental problems associated with deforestation in the region and can be used as a valuable tool for future studies of deforestation and environmental degradation in the Niger Delta Region while also serving as an instrument for informed decision-making to enhance policy implementation and speed up local development.

FINANCING WATER, SANITATION AND HYGIENE (WASH) IN SCHOOLS IN RURAL CHINA

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In 2015, China achieved both the Millennium Development Goals' targets for improved drinking water and basic sanitation: the proportions of people with access to improved drinking water and sanitation increased from 67% to 95% and 48% to 76% respectively during the past 25 years (WHO, & UNICEF, 2015). However, the achievement of UN MDGs conceals the disparity among different socioeconomic groups: a large proportion of students in rural China still do not have access to what China has claimed to achieve. Furthermore, little data are collected or analyzed on improvements in WASH in schools, especially in rural areas. This report attempts to fill in this research gap by presenting a comprehensive picture of the main funding sources for WASH in schools in rural China from a top-down perspective based on literature reviews of government reports, NGOs reports, publically accessible official data and academic papers.

This report finds that WASH in schools in rural China is mainly funded through government investments on improving water supply and sanitation in rural areas, education expenditures and funds from international organizations and domestic NGOs. Through drafting the national Five-Year Plans on improving water supply and sanitation in rural areas, the National Development and Reform Commission, the Ministry of Water Resources, the Ministry of Health and the Ministry of Environmental Protection are in charge of allocating funds for the initial capital costs of WASH projects in schools in rural China. Funding from the Ministry of Education is responsible for covering the reoccurring costs and serves as a complement to the capital costs. International aid and loans and domestic charities are important financing sources for WASH projects in some remote rural areas.

Problems of current financing mechanism of WASH in schools in rural China identified in this report include lack of independent national action and budget plans for WASH in schools in rural areas, lack of clearly defined responsibilities of government agencies involved in WASH in schools in rural areas, weakly enforced standards, lack of monitoring and assessment and ignorance of hygiene education in rural areas.

THE BARRIERS AND OPPORTUNITIES FOR IMPROVING ENERGY EFFICIENCY FOR LOW-INCOME RESIDENTS IN PHILADELPHIA

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This brief is aimed to present information regarding the barriers and opportunities for energy efficiency & weatherization investments for low-income residents in Philadelphia. This will be used to show Philadelphia's City Council, and energy efficiency & weatherization financial institutions, the extent and diversity of low-income residents within the city, availability of government and utility backed financial investments to help fund energy efficiency investments, and to show the feasibility of an On-Bill Recovery (OBR) program to make financing these investments easier for all parties. This information can be used to assist the City of Philadelphia's efforts in launching the recently announced *Philadelphia Energy Campaign*, which is a 10-year, \$1 billion jobs program that will address the lack of energy efficiency investments throughout the city's low-income residential properties (in addition to its municipal buildings, public schools, and small businesses). It can also help Philadelphia meet the target carbon emission reduction goals for the Commonwealth of Pennsylvania set by the EPA's *Clean Power Plan*.

POTENTIALS AND LIMITATIONS OF UAV (UNMANNED AERIAL VEHICLE) APPLICATIONS IN ENVIRONMENTAL RESEARCH

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UAVs or drones are becoming popular among hobbyists as well as in the scientific community. Their distinctive advantages as a low-cost, lightweight, real-time, and high-resolution imaging platform, make UAVs an attractive alternative to satellite and manned aircraft in collecting aerial data. In order to inform environmental scientists of the growing promise of UAVs and maximize their benefits, there is a need to study UAV applications across environmental areas. Understanding their potentials and limitations given state-of-the-art science and current policy environment, scientists can make the best use of this emerging monitoring tool.

BROWNFIELDS: A MISSED OPPORTUNITY FOR SUSTAINABILITY

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Businesses, communities, and builders are in need of property to construct homes, community gardens, and company offices. With this demand for continued expansion of construction, land is needed. Unfortunately, there is not enough viable open green space to construct these new projects. Part of this problem originates with the demand for new construction to occur in already developed areas. A sustainable solution to this problem is to develop these projects on Brownfield properties. A Brownfield is a property, expansion, redevelopment, or reuse which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. This research examines the risks and rewards associated with redeveloping Brownfield locations. Federal laws have made it advantageous for prospective buyers of these properties to gain economic benefits from redevelopment. Left unused, vacant Brownfield properties mark a missed opportunity for would be developers, communities, and businesses. However, there remain great liability risks while redeveloping Brownfields. Part of these risks come from the potential for increased toxic spills, exposures, and further contamination while undertaking the cleanup of hazardous substances. In fact, the Federal Brownfield law states that an entity will be liable if it aggravates or contributes to the existing contamination. Thus, in order to best evaluate a site, prospective purchasers need to perform a thorough independent risk assessment on a Brownfield property to know the types of toxic chemicals present as well as their quantities. Through this risk assessment the prospective Brownfield purchaser will be able to determine any human health exposure as well as potential uses for the proposed site. Prospective purchasers who fail to perform their due diligence, risk significant liability exposure. For this reason alone, performing an independent risk assessment is a worthwhile investment. Specifically, it helps insulate and evaluate liability exposure for prospective purchasers of Brownfields. In the end, in order to have sustainable redevelopment growth, prospective purchasers of Brownfields need to evaluate whether the economic advantages outweigh the liability risks.

PROJECT FINANCE, EXPORT CREDITS AND THE ENVIRONMENT

Dongjoon Lim (2015)

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This study introduces the two sets of international environmental and social standards that serve as environmental risk management frameworks in project finance transactions: the Equator Principles and the OECD Common Approaches. Whereas the Equator Principles is generally adopted by private financial institutions, the Common Approaches is exclusively adopted by OECD export credit agencies (ECAs), public agencies that provide government-backed financial supports to national exporters. Although both standards have had success in encouraging financial institutions to develop and disclose policies for managing environmental risks and establish them as regularized standards in project finance markets, critics have pointed out its limitations. The paper explores the origins and the effectiveness of both standards and identifies three challenges to the current structures of the policies. First, critics have called for greater transparency around financial decisions and the environmental conditions attached to financial commitment. Second, many point out that adopting the frameworks have had limited impact on curtailing environmentally harmful projects such as large dams and coal-power plants. Third, critics have demanded recourse for local communities adversely affected by project finance transactions. The prospect of fundamental reform is pessimistic as aligning ECAs with global sustainability policy objectives may compromise their mandate to promote national export.

CRISIS AND RESOURCE CONFLICT: AN ANALYSIS OF ECONOMIC CRISIS AND INTERNATIONAL FRESHWATER RELATIONS

Samuel Scott (2015)

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This study was designed to look deeper into international relations over water resources. In particular, this study looks at how states interact with one another over water resources during times of economic crisis versus times of normalcy. Based on an idea called *signaling theory in international relations*, this piece sought to test whether or not state leaders were using international water relations as a means of proving to their constituents that they were actively defending the state's natural capital and thus could be trusted to lead the country. In other words, were threats and conflicts over water resources being used as a means of gaining political capital during times of crisis? Using the Transboundary Freshwater Dispute Database produced by researchers at Oregon State University a number of statistical regressions were run to determine the weight of these crises on freshwater relations combined with a number of independent variables to account for environmental and political considerations. Ultimately economic crisis indicators proved to be statistically insignificant influencers on water relations. However, it can be shown that states in certain types of crisis have, on average, slightly better water relations than states in times of normalcy. This study also confirmed previous scholarship, noting that environmental variables tend to be the largest indicator of freshwater conflict. Indicators like water stress, drought severity, and inter-annual variability had the largest impact in dictating how a state would behave with its neighbors over shared water resources.

A BUSINESS PLAN FOR ADVANCING PRIMARY RESEARCH FINDINGS ON SOCIOMETRIC NETWORKS AND LEARNING PREFERENCES IN THE US WATER INDUSTRY

Patricia R. West (2015)

Readers:

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The U.S. water industry is under tremendous pressure to respond to a complexity of challenging, concurrent imperatives. Water resources managers are acknowledged to be experiencing a paradigm shift in how they view themselves and how they deliver services. The need for knowledge sharing, collaboration and innovation is certain. Sociometric network analysis reveals the central role that informal, peer-to-peer exchange among professional colleagues and industry opinion leaders plays in the process of innovation diffusion and sharing of knowledge. Sociometric research studies illuminate these important channels of exchange, identifying specific peer-to-peer communication pathways within defined professional groups. Sociometric research utilizing primary, survey-based, research techniques was conducted as part of a 2013 MES independent project, with a specific focus on the 200 largest cities in the U.S. The project generated two important findings: 1) Peer communication networks across leaders in the U.S water industry are, for the most part, not well connected and; 2) The two most-preferred sources for learning and gathering new information and knowledge among survey participants are on-the-job experience and peer interaction. A comprehensive business plan is presented here to capitalize and provide actionable solutions related to the findings from the industry sociometric research. Specifically, the business plan: 1) Defines the framework for a software-based platform that will build and leverage industry network data; 2) Presents a model for the advancement of the cultivation of peer-to-peer network development, information sharing and collaboration in order to drive change, diffuse innovation and respond to current challenges faced by the U.S. water industry within the context of a revealed industry preference for peer interaction as a primary source for new information and knowledge; 3) Systematically defines the specific processes, sequencing, dependencies and risks associated with the launch of this business endeavor.