
**Public Hygiene Lets Us Stay Human (PHLUSH)**

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# Sanitation Policy Advocacy in Flush-and-Forget America

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## ABSTRACT

Sanitation is the silent science, simply absent from most private and public discourse in the United States apart from scatological literature and toilet humor. “Flush and forget “operates at individual, household and societal levels.

It's time to start the conversation. To involve everyone in the search for options that are socially, economically, and environmentally sustainable, we need to reframe key sanitation issues. This presentation explores five policy arenas in which advocacy can take place. It highlights work currently underway and suggests approaches to citizen advocacy, policy reform and code change.

First is global equity, putting access to sanitation on a par with the right to clean drinking water. Through aid and trade, inappropriate sanitation systems have been exported to the developing world. Many now feel the responsibility to develop and bring to scale alternative systems for rich and poor nations alike.

The second arena for advocacy is operations cost. Urban sanitation has become a sophisticated process of fouling drinking water only to clean it up again. The costs need to be recognized and technical and scientific hardware and software allocated more productively.

Third is disaster preparedness. Infrastructure failure is likely in regions vulnerable to cataclysmic events, such as earthquakes. Contaminated drinking water supplies and non-functioning sewer systems threaten community health within days. Training can help households and neighborhoods prepare while making salient open discussion of sanitation.

The fourth policy arena is food security. Agriculture now relies on rapidly disappearing natural resources. All living things need the nutrients in fertilizers which run off the land, cause eutrophication and cannot be reclaimed. Peak Phosphorus allows us to frame the problem and the solution. We have sustainable supplies of human waste to close the nutrient loops.

Fifth is green building, both at the household level and in urban planning. As demand grows for energy-efficient buildings, rainwater capture, and gray water reuse, on site treatment and recycling of human waste must become commonplace.


## HOW DO YOU START THE CONVERSATION?

*The toilet was designed to implement the Victorian mandate for fecal denial.... Everyone knows that everyone poops, but everyone poops using apparatuses designed to create the appearance that no one does. Our infrastructure makes invisible what our bodies makes universal. A tremendous social contradiction is the result.*[1]

Dave Praeger, *Poop Culture: How America is Shaped by its Grossest National Product*

### Toilets and the difficulty of civil discourse

Why is it so hard to talk toilets? How is a topic as important at sewer infrastructure so easy to avoid in public discourse? How come we keep defecating in drinking water only to have to clean it up again? Why isn’t everyone talking about restorative sanitation and closing nutrient loops?

Raise the issue of making public restroom available in an American city and an uproar is likely the result. No matter how thoughtful a proposal to install a new toilet, it inevitably attracts a series of unspeakably ugly comments in the blogosphere as the scrubbed owners of private bathrooms comment about the strangers who will use the facilities. And the ferocity of the backlash is directly proportional to the distance between the home of the offended middle class citizen and the proposed facility. Political correctness goes out the window. The poor and homeless are verbally dragged through the mud, dirtied and deemed undeserving of access to the most basic hygiene.[2]

The Portland Loo is an innovative sidewalk toilet designed for use in high traffic areas of Portland, Oregon. The solar-powered Loo has gained critical acclaim because it offers a happy medium between the comfort of a very private individual stall and connection with a fairly noisy, anonymous downtown street. Slanted louvers at the bottom of the enclosure allow attentive passers by and public safety personnel to observe if a user has fallen to the ground or if there are too many feet.[3] But while designers and urban planners are enthusiastic about this elegant piece of street furniture, sectors of the public remain resistant.[4] The Loo is still a public toilet and therein lies the challenge.

In *Poop Culture: How America Is Shaped by its Grossest National Project*, journalist and social analyst Dave Praeger defines the challenge of public toilets in these terms:

> *A significant portion of the 350 million toilets in America are in schools, offices, churches, theaters, and other places of public accommodation where the boundary between public and private is blurred and pooping occurs in a room appropriately sequestered from public space but nevertheless within the sight, smell, and hearing of others. Because of the contradictions of these public bathrooms, people observing the behavior of the poopers are unsure whether they are reinforcing social norms or violating them.*[5]

Class demarcation plays a role in this as well. Up through the mid-19th century, the acts of urination and defecation were fairly communal and equitable. It was quite okay to share a privy or carry one's chamber pot to be emptied. As social mobility ramped up in the Victorian period, however, class conscious people embraced their flush toilets, differentiating themselves from those of lower status according to the degree of ownership of the enclosure and the quality of the hardware. And with its "roots in fecal denial"[6], the flush toilet exacerbated the confusion. Embraced by the then more egalitarian society in the New World, the flush toilet carried this culture of fecal confusion straight into American homes.

Most Americans' first experiences with shared toilets occur at school, where restrooms offer neither supervision nor privacy and can easily turn into arenas of harassment or bullying. According to Praeger, the trauma endured in school facilities "mutates into a fear of public bathrooms" and shapes the attitudes of contemporary society. [7]

## Denial, euphemism, and lack of interest

The American sense of linguistic propriety is also to blame. Victorian euphemism dominated American radio and television for years. In the 1950s, producers could not imply that married people had sexual relations nor describe a woman as "pregnant." By the end of the century all the formerly censored themes were there: nudity, gay sex, incest, menstruation, masturbation. But while the bedroom door has opened, the bathroom door remains largely closed, opening only for scatological humor's shock value.

When two professors of sociology issued to a call for papers in gender studies relating to restrooms, their professional colleagues reacted strongly to the topic itself and fell into two camps. "Some called our project long overdue and inspiring. Others said that our project was an immoral, even scatological, perversion and a waste of public funds." [8]

The general public, meanwhile, may simply not be interested. In contrast to other areas of material culture, Americans have been extremely slow to adopt innovative toilet technologies. Rose George gives points to the overwhelming lack of American demand for a whole host of products and fixtures. Hopeful marketers have parlayed innovations, only to be greeted by complete indifference from consumers. Despite the stylish finish of high end home bathrooms, bathroom behavior appears to be so inflexible that change is not even considered. [9]

Among the products that have fared especially poorly, are those that entail a move toward replacing toilet paper with washing. If the world's inhabitants are divided into washer and wipers, the latter very much have the upper hand in the US market. Neither high tech Japanese toilets not bidets have ever proven popular. Praeger finds American reluctance to try washing inconsistent with general practice. "If you got poop on your arm, you'd wash it off, not smear it off. " he writes, "And, yet for the butt we're content to smear."[10]

Innovations in the public realm hardly do better. Self-cleaning Automatic Public Toilets just don't seem to work in the US, as evidenced by the experiences of a number of jurisdictions.[11] The rare, new tax-supported public restroom is often built in a traditional, mid-20th century style that fails to anticipate the needs of a rapidly changing society. For most architects, urban planners and the stakeholder committees that advise them, toilets are incidental, not central to human need.

## Framing issues and identifying policy arenas

So how do you start the conversation? Sanitation issues can be framed by something larger, more important, less frightening, or simply more clearly aligned with "the right thing to do." In this paper, we suggest five public policy arenas where the conversation about sanitation can start: Global equity; the cost of operations, both financial and environmental; disaster preparedness; food security; and green building. From there we can develop messages and find promising channels for moving them into public consciousness.

### ARENA 1: GLOBAL EQUITY

*All Lives Have Equal Value* [12]

Gates Foundation Tag Line

The reality of 2.5 billion toiletless fellow humans is slowly seeping into American consciousness. The notion of living without a toilet strikes at basic human values in a way that years of euphemistic talk about clean water could not.

According to the University of Maryland's Program on International Policy Attitudes, Americans are undergoing a "globalization of values'. Survey data indicate that nearly three quarters agreed with the statement "I regard myself as a citizen of the world as well as of the United States." Many people are just as concerned about suffering outside of national boundaries as within. When asked about are specific varieties of suffering - hunger, poverty, police brutality - the range of difference between their concern for fellow American and for fellow global citizens remains small. Environmental awareness and a new sense of equity in employment have grown

global as well. For example, an overwhelming majority of Americans believe that US companies should abide by US environmental protection laws and US Labor laws even though they know they is likely to raise prices of consumer goods and make competition with non-US companies tighter.[13]

Under the Paul Simon Water for the Poor Act of 2005, US funding of water supply, sanitation, and hygiene (WASH) rose 82 percent from fiscal year 2006 to 2009. In a recent report to Congress, however, the Government Accountability Office criticizes the allocation of U.S. development assistance for water and sanitation and pleads for a more strategic approach. The GAO notes a lack of benchmarks, measurable goals, and verifiable results and calls on the State Department to better document funding needs.[14] The Paul Simon Water for the World Act, which passed the Senate in September 2010, would mandate the transparency and cost effectiveness while leveraging resources of the private sector. [15]

Meanwhile 2010 has seen the Bill and Melinda Gates Foundation, whose tag line boldly asserts "All Lives Have Equal Value",[16] throw its weight behind sanitation.[17] The Foundation is working to end open defecation by scaling up community led total sanitation, investing in innovative technologies and scalable business models, and becoming a major player on the advocacy and policy front. And Bill and Melinda Gates' personal plea to fellow philanthropists to transfer half of their wealth in their lifetimes, can bring actionable attention to the needs of the 2.5 billion.

Finally, 2010 brought the declaration by the UN General Assembly that access to water and sanitation are a human right.[18] The UN Independent Expert on human rights obligations related to access to safe drinking water and sanitation later affirmed that "for the UN, the right to water and sanitation, is contained in existing human rights treaties and is therefore legally binding."[19]

Though billions are poured into global health, diarrhea still claims more than 4000 children a day. The people of our planet are starting to see sanitation as the missing piece in development. It's time to take our responsibilities to scale, to do it right this time and to make sure Americans are on board.

A number of organizations in the US are educating the public about global equity, documenting the facts, advocating sensible foreign aid programs, underlining the threat of world poverty to our way of life. Faith -based groups often work from the bottom up, rallying congregations at the local level while supporting national level advocacy and international action. Humanitarian organizations such as Mercy Corps operate physical and online centers[20] where school children can learn about the lives of their peers living in poverty or the aftermath of crisis and communicate directly with them.

The turn of the millennium comes with fresh social entrepreneurial approaches, what the *New York Times* Nicholas Kristof refers to as "do-it-yourself foreign aid."[21] Programs like Kiva[22] combine micro-finance and the internet so that individuals can lend to entrepreneurs across the globe. Universities that a generation or two ago sent undergraduates to the capitals of Western culture, now have a presence in the Global South. Add to this, the proliferation of person to person initiatives in which small local groups collaborate across international boundaries to get to know one another, identify shared goals and work toward them.

The global campaigns of large organizations such as ONE[23] and 350[24] are reaching millions with their pleas for a more equitable world. Advocacy efforts extend from participation at the 2010 MDG Summit to ceaseless awareness creation at the grassroots. These organizations host websites that combine video, often featuring celebrity spokespeople, with social networking, which gives even children the opportunity to reach both peers and policy makers. They use compelling, universal messages to reach the grassroots and to encourage quick easy hands-on events which bring activists together around issues. The appeal to people's sense of global equity is seen in campaign tag lines such as ONE's "Live in a World where No Child is Born with HIV".[25]

Named for the number of carbon parts per million considered safe in the atmosphere, 350 inspires people to rise to the challenge of climate change and to hold leaders accountable for reducing carbon emissions. While the organization is inclusive, the burden of change lies primarily with the US, and to a lesser extent with other industrialized nations. Their 10-10-10 event resulted in 7,000 gatherings in 188 countries 350 is also one of a number of global organizations that have launched competitions. More than 900 schools world wide are implementing campus greening projects to accumulate points in 350's ongoing Great Power Race[26]. Competing teams choose among hundreds projects on a list that is reminiscent of scout merit badge requirements. While there are categories on Health, Water and Waste, there do not appear to be projects in sanitation nor those that assess the energy consequences of sanitation systems.

Like ONE and 350, the increasingly popular World Toilet Day campaign mobilizes local groups by providing strong global messages, compelling graphics, fact sheets, social networking tools, and publicity for events. International NGO have also adopted the event. Of note in 2009 was WaterAid UK's online campaign demanding then-Prime Minister Gordon Brown to "talk toilets" and prioritize sanitation in foreign assistance.[27] Collaboration with more general global campaigns that reach millions may enable the World Toilet Organization to break existing taboos and significantly scale up the reach of the toilet message.

## ARENA 2: OPERATION COSTS

*The toilet was created to solve eighteenth-century problems of decorum, and was spread across society to solve nineteenth century problems of sanitation. Now...we have a few twenty-first century problems: the cost of the sewage infrastructure and its environmental impact. The flush toilet can't solve the problem this time, because this time, the flush toilet is the problem.*[28]

Dave Praeger

*The US EPA estimates that $390 billion is needed over the next two decades to update or replace existing wastewater systems and/or build new ones to meet growing demands. Propping up the current infrastructure and continuing to address our urban water and wastewater needs with outmoded centralized systems threatens to bankrupt our communities.*[29]

Cascadia Green Building Council

As the grassroots revolt against government gains steam, at particular risk are public goods, particularly those that civic discourse does not hold in sharp focus. While Americans prize clean water, few know much about their municipal sewers, treatment plants and the capital intensive sanitary engineering that ensures things work. Without a citizen constituency, US water and sanitation infrastructure will simply not keep up with population and consumption pressures, to say nothing of environmental values. There's a need for public education.

Unless there is sound administration of public goods, problems of the commons result. In *Urinetown The Musical* a drought-exacerbated water shortage, causes corrupt officials to outlaw household toilets. Instead, the city outsources toilet services and strong-armed policing of those who did not use them.[30] Sings Urine Good Company CEO Caldwell B. Cladwell. *I took this town that formerly stank. I took this town and made it smell swank! I made flushing mean flush at the bank! I'm the man With the Plan And so whom should you thank?*

In the US, water issues are far more salient in individual consciousness and public advocacy than sanitation challenges. Public support for clean water and action to clean it up remain strong. Surveys show that water pollution is consistently a top concern for Americans. Eighty-one percent report, moreover, that environmental issues such as clean water, clean air and open space are criteria in their voting choices and where they choose to reside.[31] If new sanitation policies are to become salient, it makes sense to carry on the discussion in the context of broadly held American values.

### Understanding the costs of urban sewers

Sanitation has fostered civilization and human progress through the centuries and remains at the heart of public health. For the average American the world of sewage is mysterious, disgusting and disturbing. Since sanitation activities don't fit clearly in any one local government agency, citizens may not know who is responsible for waste water treatment as opposed to drinking water and solid waste. It's important, however, to understand sewage and what happens to it. With sewers and wastewater treatment such huge line items in every local budget, talking about the financial and environmental costs is a way to start the conversation.

The first sewers in the United Kingdom and the United States were built at a time when miasma avoidance and filth theory of disease were in vogue. It wouldn't be until the 1890s that the germ theory would catch on with the public[32], despite John Snow's valiant efforts. The solution to pollution was dilution. Putting everything into the lake, river and sea solved the filth problem by moving it out of the cities.

When the down-streamers got sick and found their supplies of drinking water fouled and their fish dying, it became clear that treatment needed to occur closer to the source. By the turn of the century cities were tacking expensive treatment plants on to their sewer lines as sort of an afterthought, a legacy that many cities are still attempting to remediate more than a century later. It was only in 1986 that New York City' opened its North River Plant. The 28 concrete-and-park topped acres built over the Hudson finally ended the flow of untreated feces into the river.

Contemporary sewer treatment plants vary significantly from locale to locale, making it all the more difficult for advocates and voters to get a handle on the technologies. Most agree, however, on basic terminology for the three principle stages of the process. Primary treatment is a simply separates relative solid material from liquid sewage; it consists of filtering and simple settling of more solid

material at the bottom of a tank. Secondary treatment involves aeration so that bacteria break down organic material. It usually relies on aerobic filtering, surface-aerated basins, activation of sludge, and use of membrane bioreactors.

Tertiary treatment further cleans and disinfects water. Also known as "effluent polishing",[33] it applies one or more techniques. Filtration is done with sand or activated carbon. Man-made lagoons offer additional settling and aerobic treatment with reeds and other plants and tiny filter-feeding invertebrates. Constructed wetlands consist of managed reed beds that use natural processes of phyto-remediation, which are inexpensive but require time. Nutrient removal addresses the problem of eutrophication: the build up of phosphorus and nitrogen which foster the algae blooms that cause dead areas in lakes and in oceans.

The term "pollution" does not do justice to the variety of substances that enter sewage treatment plants: feces, urine, gray water, drugs, hormones, chemicals, kitchen grease[34], etc. Despite the various processes used during primary, secondary and tertiary treatment, pharmaceuticals have proven particularly difficult to remove. Triclosan, a key ingredient in popular antibacterial soaps, is especially problematic. Not only does it contribute to building the resistance of harmful bacteria, it combines with other matter to produce more toxic substances.[35]

What's more, various pollutants are regulated by different jurisdictions. It's the responsibility of the Environmental Protection Agency (EPA) to protect the ecosystem while the Food and Drug Administration (FDA) regulates the pharmaceutical industry. Collaboration between the two is necessary to establish and enforce regulations regarding drugs in the water system.[36]

Environmental groups have petitioned the FDA Commissioner to tighten environmental regulation of drugs entering the water supply. They are calling for an end to the provision in 21 C.F.R. Part 25 which allows "a categorical exclusion to environmental assessments for new drug applicants."[37]

Until information about pollution is more transparent, clean water advocates will remain in the dark and unable to act. Currently there is no single clearinghouse where people can inquire about pollution in their communities.

The EPA is required to issue a Toxics Release Inventory (TRI) that that tells the nature and quantity of toxic substances that businesses and public agencies release into waterways. The report is transparent and provides all parties with essential information. The list has spurred polluters toward significant reductions and the removal of some from the list all together. Reports one multi national firm: The initial demand for environmental reporting came from the public. But in responding, we have discovered that the information is extremely useful to our own management. We have learned about our successes, our inadequacies and the gaps in our knowledge. It is a good example of the way in which external pressures ultimately prove the benefit both to the environment and to industry.[38]

Unfortunately the EPA is not required to report on sewage released in waterways, which is particularly heavy during Combined Sewer Overflows (CSO). The Natural Resources Defense Council (NRDC) advocates creation of a "Sewage Release Inventory," modeled on the TIR that would require sewage authorities, municipalities, and states to report on releases of raw or inadequately treated sewage. "While the EPA continues to dither, says NRDC, "Americans are denied notice of contamination in the waters from which they drink and where they swim and fish."[39]

## The high cost of getting rid of sludge

A by product of treatment is sewage sludge, semi-solid matter that industry public relations people have renamed "biosolids." There are five options for getting rid sludge: landfill, incineration, gasification, land application or disposal at sea. Landfill and gasification processes are very expensive and the US Congress banned the practice of simply dumping sludge into the ocean in 1998.

All of these processes spew environmentally costly externalities because sludge concentrates antibiotics, hormones, and heavy metals onto the land. "Sewage sludge is even dirtier than the name sounds," said Earthjustice attorney James Pew. "It's full of dangerous substances like heavy metals and toxic industrial chemicals that accumulate in wastewater."[40]

When sludge is smeared on agricultural land, lime is added to help prevent contaminants from growing up into plants or moving down into aquifers. But in order for lime use to be effective, the pH must fall in a narrow range. Without accountability measures, there is no way of knowing how many contaminants have already entered our food chain. Some nations - including Switzerland and The Netherlands - have banned the use of sludge in agriculture.[41]

Burning sewage sludge in an incinerator releases mercury, lead, acid gases, dioxins and other cancer producing toxic chemicals into the air, threatening the environment and the health of residents of neighboring communities. In October 2010 the EPA finally proposed new air quality measures for sewage sludge incineration, but environmentalist say they need to be further tightened.[42]

## The fallout from combined sewer outfalls

Populations pressures, lack of storage capacity and value engineering of sewer systems led cities to merge storm drains with sewers carrying waste water, with the resulting combined sewer overflow (CSO) on days of heavy rain. Nearly 800 mostly older cities in the Northeast, the Great Lakes region and the Pacific Northwest currently serve 40 million people with combined sewers systems.[43] Costly retro-fittings to mitigate CSO[44] continue today in many American cities but a few minutes of heavier than usual rain can trigger an overflow. Writing in the *New York Times*, Rose George says, "Each week, New York City sends about 800 Olympic-size swimming pools or sewage-polluted water into nearby waters because there is nowhere else for it to go." [45] City of Seattle officials report that there were 30 billion gallons of sewer overflows in 1970 but that this has been reduced to 100 million gallons today.[46]

Environmental scientists estimate that sewage outfalls near 28 California beaches have caused an additional 1.5 million residents to spend $50 million in medical treatment for gastrointestinal illnesses. Residents of communities around the Great Lakes are at the increasing number beach closures due to pollution. President Obama's recently established the National Policy for the Stewardship of the Ocean, Coasts, and Great Lakes seeks to coordinate federal decision making and to give as much attention to Great Lakes coastlines as to salt-water shores. The NRDC as applauded the "landmark policy" as "an unprecedented, comprehensive effort to better coordinate federal decision-making."

Outdated systems of hard infrastructure require upgrading with costly new pipes, pumps, storage tunnels, and treatment plants. But improvements in the traditional system needs to be coupled with investment in green infrastructure that reduces the volume of flows, improves stormwater quality, conserves energy and "promotes more aesthetically pleasing neighborhoods."[47]

## Linking water conservation values to sanitation

Americans value water conservation. Now it's time to more firmly communicate the links between water and sanitation and between household consumption and The advocacy group Food and Water Watch says 1.2 trillion gallons of water is lost annual due to aging pipes..[48]

Toilet use accounts for nearly a third of water use in the average American household, producing a staggering volume of sewage that cities and towns must deal with. Low flush technologies came slowly to the US but eventually had high impact. In 1992 Congress passed the energy policy act mandating toilets using not more than 1.6 gals of water per flush beginning Jan 1, 1994. For a family of four, this represented a savings of 14,000 gallons over 3.5 gal, which had been standard since the mid 1970s. But the program got off to bad start. First there was citizen push back at government interference in their home bathrooms. Second, some suppliers simply retrofitted the older models with new valves set for 1.6 gals and they didn't work very well. In time, toilet manufacturers perfected the technology and New York City was able to report that low flow toilets saved $605 million in deferred sewer expansion.[49]

To protect and conserve water resources, Food and Water Watch call for an approach that is integrated and tailored to local conditions. It would include include infrastructure repairs, public education on water conservation, and consumer incentives for water-efficient appliances and landscaping, and fewer rate breaks for industry, which accounts for 53% of water use in the US.[50]

## Energy costs

Cleaning up sewage is extremely energy intensive,[51] with wastewater treatment in US accounting for 1.5% of all electricity use.[52] Policy makers have given relatively little attention to energy costs and yet there is scope for significant savings. Energy is consumed at every step of sewage treatment. Unfortunately, the dual challenges of power shortages and water scarcity, which are especially acute in 7777the American West, are often seen as parallel tracks. If policy makers, energy specialists, and sanitation experts explore the links, they can reduce energy use while improving the efficiency of the system.[53]

Cost recovery in sewage treatment includes everything from sludge farming[54] and gray water recycling to methane gas reuse for cooking[55] and struvite production. [56] Resource shortages and technical advances are fostering promising new approaches. Some plants with biodigesters use the resulting methane to produce electricity to power the plants themselves. This technology, however, is vastly underutilized. Slightly more than half of treatment plants large enough to produce energy cost-effective using anaerobic digestion, do so. Of the plants that produce gas, about 4 in 5 simply flare it off. Based on 2007 EPA estimates [57], the 544 plants with anaerobic digesters are capable of providing power to 340,000 homes. This would offset 2.3 tons of CO2, with an impact equal to planting 640,000 acres of forest or taking 430,000 cars off the road. "Resource recovery from wastewater counts as renewable energy, which makes sense: we're hardly likely to stop providing the raw material anytime soon.", writes Rose George, "So why continue to flush away a resource whose value should be blindingly obvious?" [58]

## ARENA 3: DISASTER PREPAREDNESS

*Oregon's coastal areas and the Willamette Valley are vulnerable to massive 9.0 magnitude quakes produced by the Cascadia Subduction Zone, a 600-mile-long fault running from northern California to Vancouver B.C.*

*Subduction zones are known for producing the most powerful seismic events on the planet, as well as multiple aftershocks and tsunamis. There hasn't been a Cascadia earthquake for 300 years, but the most recent forecast from the U.S. Geological Survey puts the likelihood of a massive quake at 40% in the next 50 years.*[59]

*Oregon Business*

*[T]ake personal responsibility for an event like this. The white hats are not coming. The police and fire departments are going to be really busy. You're on your own.*[60]

James Roddey, Oregon Department of Geology

Katrina flooded New Orleans with raw sewage as the rest of the United States looked on in horror. The relatively slow unfolding of the tragedy left us contemplating dozens of what if scenarios. " What would we do here in our neighborhood?" Who would check on me? Who would I need to check on? How would we do that?

Having experienced earthquakes, storms, tsunamis, and man made disasters with an immediateness that only the new media can bring, many Americans are now contemplating their options and engaging in emergency planning. With guidance from the Red Cross and other agencies they are putting together emergency kits with basic supplies for three days. They are designating meeting places and thinking out emergency communication chains that can be activated in the absence of electronic communications. Although local governments may be assessing risk, listing priorities, and investing in special equipment and training, it's ordinary citizens who are rallying their neighbors behind disaster preparedness.

The conversation is necessarily local. Movements such as Transition US are embracing the opportunity to strengthen communities and make them more resilient in the face of adversity. Whether sudden or slow moving; foreseen or unforeseen, widespread or localized, emergencies require people to think about their basic needs. Ensuring that people can defecate and urinate with some modicum of dignity is a dearly held need. Likewise, communities must restore their ability to manage urine and feces. Disaster preparedness, therefore, is an arena for sanitation advocacy, an opportunity to start the conversation.

Portland, Oregon is located on the Cascadia Subduction Zone, a 600-mile fault extending from Vancouver BC to northern California. The last Cascadia earthquake was 300 years ago but now the "U.S. Geological Survey puts the likelihood of a massive quake at 40% in the next 50 years." [61]

Oregon lags behind California and Washington State in earthquake awareness for two reasons. First, there have been no recent destructive quakes. Second, it was not until 1989 that geologists identified the extent of the Cascadia Subduction Zone and quickly reached unanimity on the risks. Subduction zones produce powerful seismic events, often lasting for minutes rather than seconds and producing aftershocks and tsunamis. Oregon is overdue in bringing its codes up to current seismic standards.

Disaster preparedness efforts have focussed largely on Oregon's coastal communities at tsunami risk. By and large, the focus of Portland City and Multnomah County agencies and the Red Cross has been on 3, 5 or 7-day emergency kits with the required amounts of food and water. But there's been relative silence on the issue of sanitation. Many local groups, however, see sanitation as an area of personal responsibility which should be provided for at the household or neighborhood levels. As the urban population grows and green spaces surrounding the city remain protected for agriculture and recreation, more and more Portlanders live in multi-story buildings. Consequently, emergency preparedness as an opportunity for personal action

PHLUSH is among the local groups promoting simple toilets using five-gallon buckets with covers, items which are routinely discarded by supermarket. For seven-day emergency use, two buckets per two apartment dwellers will suffice. As urine and feces should be separated for easier management, one bucket can serve as a composting toilet the other as a waterless urinal. A bag of sawdust assists composting and a long tubed funnel can facilitate use of the urinal by women and women. Buckets can be nested with supplies inside and easily storied. The sanitation research and development group Cloacina.org has publicly proposed a series of prototypes[62] and made available how-to instructions, including an illustrated zine on containerized dry sanitation.

## ARENA 4: FOOD SECURITY

*There are currently no international organizations or intentional governance structures to ensure the long-term, equitable use and management of phosphorus resources in the global food system. In order to avoid a future food-*

*related crisis, phosphorus scarcity needs to be recognized and addressed in contemporary discussions on global environmental change and food security, alongside water, energy and nitrogen.*[63]

"The Story of Phosphorus"

## Insecurity peaks

The Peak Oil discussions ushered in a practical conceptual framework. A peak is the point of maximum production or extraction of a commodity, an estimate lying at the intersection of quantity and historical time. It can be seen as "the point in time when production will no longer be able to keep up with demand due to economic and energy constraints."[64] While accuracy is important to policy planning, disagreements in the scientific community about exact numbers do not lessen the usefulness of the concept to policy advocacy and citizen education.[65]

The convergence of various peaks clarifies the seriousness of the impending crisis in the industrialized agricultural system to which Americans have become accustomed. Food needs oil to cover the distance[66] from farm to mouth. As fossil fuels peak, electric vehicles start rolling off assembly lines, the lithium and neodymium in their batteries already approaching peak.[67]

The Green Revolution of the 1960s and 1970s owed its success to new strains of genetically modified plants, to irrigation techniques which facilitated agriculture on arid lands, and to fertilizers. The Haber Bosch process made it possible to take nitrogen from the atmosphere to create ammonia, which after oxidation produced the nitrates and nitrites in fertilizer. The Green Revolution fertilizer production was also characterized by the intensive mining of phosphate rock.

In June 2008, the *London Times* reported that the price of phosphate rock had risen 700 percent in the previous 14 months.[68] This indicates unprecedented new pressures on old supplies at a time when the planet is poised to have nine billion inhabitants by mid-century. Like oil, phosphorus[69] production is peaking.

## Phosphorus & fossil fuel: both vital to food security, both peaking

Non-renewable oil and non-renewable phosphorus have been vital to food security, and helped spawn today's trade based global system. Once limited to commodities, global commerce in food has now gone retail, with less and less of value added locally. Walmart's 8,416 stores world manage the supply chain from field to fork. Supermarkets now account for more than half of retail food sales in China and Latin America.[70]Fresh local fare is being replaced by salt-fat-and sugar-rich processed food, which fuel the system's profits. As a result, obesity is becoming a global phenomenon and the fossil fuel costs for production and distribution are staggering. The situation is ultimately not sustainable and has already put the food security of many nations at risk.

So too with phosphates. A full ninety percent of the global excavation of phosphates is controlled by a mere five countries. Morocco, China, United States, South Africa,and Jordan. Morocco, including the disputed territory of the Western Sahara, controls a third of global reserves. China has started to conserve their supplies by levying a 135% tariff on exports. Despite being a top producer, the United States now imports 20% of its supplies. Meanwhile world consumption of phosphates continues to rise 3% annually. In more affluent countries this is exacerbated by meat consumption and food waste, while Asia uses proportionately more phosphorus in agricultural production.[71]

Speaking before the US Congress in 1938, Franklin D. Roosevelt said, "The phosphorus content of our land, following generations of cultivation, has greatly diminished. It needs replenishing. I cannot over-emphasize the importance of phosphorus not only to agriculture and soil conservation but also the physical health and economic security of the people of the nation."[72] More than seventy years later, in an Earth Day 2010 presentation to the Sustainable Phosphorus Institute, University of Arizona Professor James Elser remarked that the situation is little better today. "There are no global institutions responsible for keeping track of how much phosphorus is out there and how long it's going to last and what we're going to do about it. No one is really watching," he said, inviting his students and university colleagues to get involved.[73]

Scientists are only now beginning to calculate phosphorus footprints.[74] Calculations may make it possible to reduce the amount of phosphorus needed to produce food. Fertilizers count for about 30% of costs in large farm production and even more for smaller farms. Sudden price hikes in both foodstuffs and fertilizers in 2007 and 2008 led to food riots in cities and unrest in the countryside,

particularly in India, a nation with zero reserves of phosphate rock.

It is true that there are supplies of phosphorus on the ocean floor, but they are technically and commercially out of reach. These deposits come from the natural die offs of marine life and more recently from the run off from commercial fertilizers. Natural plus man-made eutrophication[75] spells algal blooms and dead zones and an end to commercial fishing. Many communities are already struggling with peak fish thanks to overfishing[76] and because phosphates are in the sea, rather than on the land where they are essential. It's estimated that a quarter of all phosphorus mined since 1950 is now in lakes, rivers and the ocean or in landfills.[77]

## No alternatives: Phosphorus is phosphorus is phosphorus.

A key difference between oil and phosphorus is that one has alternatives and the other has none. Since there are alternate forms of energy: solar, hydro, tidal, human, etc. - so the role of oil in food security can be replaced.[78] All living things need phosphorus to live. It's an element - number 15 on the Periodic Table - and cannot be synthesized or produced once reserves are gone. And nothing can take its place.[79]

Phosphates are vital to human health. Humans have about two pounds of calcium phosphate in their bones and more in their teeth. Phosphorus is essential to biochemical reactions required for cellular activity. DNA is made of repeating elements held together by phosphates. RNA has phosphorus rich ribosomes. Quips Elser, "Phosphates hold your genes up."[80]

Phosphorus can be recovered and reused, unlike oil, which can't be. What's more, recovery from biomass, agricultural byproduct and human excreta, puts it within reach of every local economy. And the reuse of phosphorus offers freedom from hunger if only for one well documented fact: The phosphorus in one person's urine is approximately the amount needed to fertilize one person's supply of food.

Of all the nutrients in excrement, urine has 80% of them, feces the rest. Urine is normally sterile and free from pathogens and heavy metals. It's far safer to use as fertilizer than biosolids, the crude by products of waste treatment more accurately known as sludge.

## Implications for policy advocacy

Neither the implications of phosphorus use in food security, nor the implications of urine reuse as a source of phosphorus have received much attention. According to Cordell et al, *The recycling of urine is a socio-technical process that has no institutional or organizational home . Rather, a lack of institutional fit means it is seen as peripheral by all stakeholders and sectors (such as water service providers, town planners and farmers) and is not currently perceived as important enough for any single stakeholder group to make it a priority.*[81]

Policy advocates have their work cut out. Fortunately, two university based phosphorus think tanks are sounding the alarm among laypeople and scientists. The Global Phosphorus Research Initiative is a multi disciplinary collaboration among independent research institutes in five countries. GPRI also engages policy makers, industry and community to look at the problem and search for solutions. In the US, the Sustainable Phosphorus Initiative (SP!) is based at Arizona State University. SPI is working to build a credible scientific consensus; catalyze an interdisciplinary global network; and motivate behavior change for conservation and recycling to establish phosphorus sustainability.

GPRI has done far more policy and practical work in the area of sanitation. Through Linköping University and the Swedish Environmental Institute they have been able to draw on Sweden's comparatively long experience with urine diverting toilets. As for SPI, they appear to be setting the stage on which sanitation research and policy reform can take place. Working within a culture afflicted by what Jan Olaf Drangert calls "urine blindness"[82] and without the favorable building and plumbing codes enjoyed in countries such as Sweden and Australia, US P-recycling groups may advance more deliberately. There is a need to build foundation for information and advocacy on which environmentally sensible experimentation can take place. In addition to coordinating a multi-diciplinary research team, SPI is creating awareness of the need for individual responsibility for food security in ways likely to foster local action. In his presentation at the SPI launch on Earth Day 2010[83], James Elser sequences messages effectively to reach the general public. He leads his audience to draw their own conclusions regarding the imperative of urine reuse.

Phosphates from sewage and animal waste have been long been recycled by the agricultural sector, but waste streams outpace needs in areas with intensive or localized animal production and in urban areas. Policy recommendations regarding phosphate recovery in the agriculture sector include the replacement of conventional crop subsidies with environmental incentives, improved management of nutrient disposal and the introduction of nutrient trading permits.[84] Policies that will broaden of P-recovery efforts include involvement of the water industry, cross sectoral collaboration in research and development and regulatory pressure.[85]

There are continuing advances in the industrial reclamation of phosphates from human waste. The Netherland's SNB Phosphate Recovery introduces the issue with the claim

that a shortage of phosphate will result in large-scale famine and political turmoil. Their website, however, carries the recent report from the phosphate mining industry questioning the date of the peak proposed by academics and activists. [86]

SNB has recently opened the world's first commercial plant that removes nitrogen and phosphorus from source-separated urine. Based in Zutphen, The Netherlands, the plant will process 5 million litters of urine a year, which represents "more than 13 million 'number ones', or the annual production of approximately 10,000 people." Urine is collected using no mix/urine diverting toilets at rock concerts and sporting events,[87] as well as through and earlier partner, Mothers for Mothers (*moeders voor moeders*).[88]

Ostara Nutrient Recovery Technologies Inc. that uses a technology developed at the at the University of British Columbia to remove nutrients from wastewater and transform them into a high quality commercial fertilizer. Based in Vancouver, Ostara designs and builds water treatment systems that extract struvite that is sold as Crystal Green®. The high quality, slow-release fertilizer used in container gardening, allows municipalities to recover some of the high cost of waterborne treatment.[89] In 2010 Ostara's technologies have won awards from the World Economic Forum, GoingGreen and the Cleantech group. Robert F. Kennedy, Jr., Senior Attorney at the Natural Resources Defense Council, serves on Ostara's Board of Directors.

Clean Water Services, the public sewer authority for 500,000 residents of Oregon's Washington County, operates the Durham Advanced Wastewater Treatment Facility, the first in the US to treat 100 per cent of the wastewater stream using Ostara's Pearl® nutrient recovery process. More than 90 per cent of the phosphorus in the wastewater's liquid stream is removed to produce 40 tons of Crystal Green® fertilizer per month for sale to nurseries in the Pacific Northwest.[90] Ostara and Clean Water Services expect that the initial investment in technology will be paid back within five years.

## Food security goes local in Portland, Oregon

The shift away from global to local food production is gaining steam in the Unites States. Americans understand that a regional or "100 mile diet" will conserve fossil fuel, use fewer chemical preservatives, and alievate the threat of hunger resulting from or political instability and interrupted supply lines. Cities across the nation are identifying vacant land that can put under cultivation and estimating how many acres it would take to grow enough vegetables to feed their residents.

In Portland, Oregon the demand for local food is growing. Hundreds of volunteers plant fruit bearing trees or glean food from fields. The city boasts 35 community gardens where individuals may grow their own food; all have long waiting lists. Lawns are disappearing as front yards of urban bungalows go under cultivation. Citizens concerned about the twin problems of hunger and obesity have launched the Multnomah Food Initiative to increase the local food supply by teaching residents to grow and process their own healthy food. This 15-year plan is being implemented by an innovative partnership among non-profits, businesses, faith organizations, schools and local governments..[91]

A growing number of Portlanders subscribe to the goal of Permaculture: "Consciously designed landscapes which mimic the patterns and relationships found in nature, while yielding an abundance of food, fiber and energy for the provision of local needs."[92] Well-informed citizens are documenting results of backyard experimentation in composting, permaculture, and urine reuse. Although public guidelines for the use of dry urine-diverting composting toilets are not yet established, many are practicing new sanitation technologies, advocating for their adoption and are proposing code changes at the state level. Citizens are also shaping the new Portland Plan - a roadmap that will guide city policy for the next quarter century.[93] They are submitting recommendations for infrastructural support for feces composting and urine recycling, including curb side pick up.

A recent study entitled "Backyard Urine Recycling in the United States of America: An Assessment of Methods and Motivations" recognizes Portland as a center of informal research, along with San Francisco and communities in coastal Massachusetts. Authors recommend implementation of more formal urine recycling projects and additional US-focussed research. They conclude that Americans can be socially accepting of urine reuse and that urine harvesting is "a good first step toward ecological sanitation practices."[94]

## Time to close nutrient loops

As the world's few phosphate mines are emptied, as phosphorus in fertilizer runs off the land, as the runoff creates great dead zones in the ocean, global food supplies will decrease. Yet, sustainable sources of essential nutrients are found in the human waste we flush down the drain. It's time to close the loop.

The concept of peak phosphorus allows us to frame the problem and the solution. Discussed in the food security policy arena, it is simply one of the most elegant ways to convey to the public the need to close nutrient loops. Peak Phosphorus works, moreover, at both the global and local levels. If there is one point on which all can agree, it is that sustainable supplies of human waste are available to close the nutrient loops. Urine reuse is significantly less complicated and costly than technologies currently in use.

## ARENA 5: GREEN BUILDING

*Civilized people ought to know how to dispose of the sewage in some other way than putting it into the drinking water.*[95]

Theodore Roosevelt in 1910

*Portland already has buildings that don't have sewage outputs, harvest gray water, have wind mills and are solar powered. The scale of going from a single building or project to an entire neighborhood of 20 acres with sustainable electricity, water, and sewage is a whole new voyage.*[96]

Mayor Sam Adams

### Cascadia's Radical Vision

The Cascadia Green Building Council is a regional chapter of the US Green Building Council with an activist vision of sanitation that is clear and uncompromising. In turning this vision into reality, Cascadia is paying attention to two fronts. First, they are addressing the numerous regulatory barriers to sustainable systems. Second, they are addressing culture attitudes toward sanitation and popular misunderstandings about alternative technologies. They see green builders as leaders with a mission:

*We have a choice. We can continue to design systems that use water as though it is a boundless resource, or we can begin to treat all water as precious. The timing for this paradigmatic shift is now as communities all over the world consider how to meet their growing needs for fresh water and sanitation.*[97]

Their commitment is to "re-imagine water and waste within a more holistic framework." Their ambitious Living Building Challenge calls for closed loop systems, rainwater capture, treatment without chemicals, and management of waste as a valuable resource. They are bold on the issue of codes, asking "regulatory community at all jurisdictional scales" to remove any provisions that interfere with responsible net zero water projects.

One the advocacy front, CGBC is exploring and education developers about decentralized systems. They question significant capital investment in centralized water treatment, imploring communities to "consider the lifecycle impacts of those systems on human and non-human communities both now and in the future."

Ultimately they envision all construction operate closed loop systems "within the water budget of the site" while respecting health of larger ecosystem. "Part of this vision is the ultimate removal of waste streams from our water, as we should never defecate in our water supply to begin with. The flush toilet will be shelved with other outdated technologies."

The goal of Cascadia's current water campaign is to promote regulatory support for and the building community's widespread adoption of net zero water (NZW) goals and strategies. Cascadia will continue to advocate for regulatory support for decentralized, sustainable approaches to water supply and treatment options; provide NZW education and resources to the building community; and foster dialogue stimulated by widely disseminated research findings.

### US Green Building Council: The LEED People

The U.S. Green Building Council, of which Cascadia is a regional group, is "working to make green buildings available to everyone within a generation." Their green building rating system Leadership in Energy and Environmental Design, or LEED was developed as a concise framework for identifying and implementing practical, measurable solutions for green building design, construction, operations and maintenance. LEED provides third-party verification that a building incorporates performance-enhancing strategies for energy and water efficient, reduction of CO2 emissions, healthier indoor environments and better stewardship of resources.

USGBC is 501(c)(3) non-profit trade group has more than 18,500 member organizations in the construction industry. Through its partnership with the Green Building Certification Institute, USGBC offers industry professionals the chance to develop expertise in the field of green building and to receive accreditation. They also provide basic and technical education on green building.

It is the regional and local chapters of the USGBC that offer sanitation advocates a multi-disciplinary forum in which to stay abreast of developments and promote water saving and waterless technologies. The Cascadia Green Building Council is one such regional group, serving the Pacific Northwest, a bioregion that includes the province of

British Columbia and the States of Alaska, Washington and Oregon. Cascadia's well-established systems of citizen involvement in the public process give sanitation advocates the opportunity to bring key issues to the table.

Since its founding in Portland in 1999, this chapter of USGBC has made significant impacts on public policy. For example, the city of Vancouver, Washington now requires LEED™ Gold certification of all new civic buildings of 500 square meters or more. Seattle[98]and Portland[99] have green building policies which evolve to meet ever higher LEED™ standards and additional requirements. Cascadia's ongoing research includes a manual for designing net zero water buildings and communities, analyzing wastewater treatment systems in Washington's Puget Sound basin, and a road map that will eventually lead to net zero water regulations.

### International Green Construction Code: Green on sanitation?

The International Green Construction Code (IGCC) released this year was developed by the International Code Council (ICC) in cooperation with the standards organization ASTM International and the American Institute of Architects.

The IGCC differs from the voluntary systems that have paved the way: LEED rating system of the U.S. Green Building Council and the Green Globes rating of The Green Building Initiative. Designed for adoption by governments and administration by code officials, the IGCC seeks to foster green building and "to achieve significant market transformation in those segments that are not likely to react to voluntary programs.[100]

Rather than use ratings, the IGCC uses project electives, which may be proposed by building owners or architects. This enables the IGCC "to produce more predictable results"appropriate for each jurisdiction and to encourage innovations which are difficult to mandate Chapter 7 of the IGCC relates to water use and contains specific requirements for non-water urinals, municipal reclaimed water, reverse osmosis water treatment systems, rainwater collection and distribution, and graywater.

Reach Code Advisory Committee of the Oregon State Building Codes Division is developing the state's first Reach Code for green building standards. This body of standards for energy efficiency will give builders an option and ensure the public that construction methods are sound. Criteria for energy saving performance criteria are being balanced with prescriptive measures. Included in the code will be overall design code for residential and commercial buildings and plumbing practices and products. In developing the Reach Code, the committee will try to take advantage of financial incentives at the federal state and local levels.[101]

Current Oregon statues and administrative rules allow composting toilets but the state's Department of Environmental Quality still require all residences to have a sewer connection or septic system. Composting toilets must comply with NSF/ANSI Standard 41.

### EcoDistricts and Neighborhood Development

LEED for Neighborhood Development was launched in a three-way partnership among the USGBC, the Congress for the New Urbanism, and the Natural Resources Defense Council. The first national system for neighborhood design, LEED-ND Rating System combines principles of smart growth, urbanism and green building. As with all LEED certification, it provides independent, third-party verification that a development's location and design meet accepted high levels of environmentally responsible, sustainable development.

Another approach to looking beyond the single building is the EcoDistrict. Examples include the Living City Block in Denver and two EcoDistricts in Sweden, Western Harbour in Malmo and Hammarby Sjostad in Stockholm. All are new development.

Portland, Oregon is taking a slightly different approach by identifying existing neighborhoods where there already is "a broad commitment to accelerate neighborhood-scale sustainability." The initiative was launched in 2009 by the City and the Portland Sustainability Institute. The five neighborhoods selected for the pilot program include the area around Portland State University, Lloyd District, Gateway, Lents and South Waterfront – North Macadam.[102]

## NEXT STEPS

Effective policy advocacy makes plain dilemmas but suggests ways out of them. Americans show a growing sense of global equity. They are concerned about economic and environmental costs. Self-reliance and community resilience are potential bulwarks against disaster. New interest in healthy sustainable agriculture is coupled with a growing concern about food security at home and abroad. And many people are working to shrink the carbon footprints of their homes and cities.

The next task is to hone messages and identify promising communication channels. As our organization explores options and documents what works, we invite readers' comments on this paper and contributions to future work. Please contact us at phlush@oldtownchinatown.com

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[3] Lescher, Barbara. “Public Restroom Design for 21st Century US Cities.” PHLUSH Presentation at World Toilet Summit. Singapore. 3 Dec 2009. http://www.worldtoiletevents.com/images/Day2/Track%201.3%20Design%20and%20Technology%20for%20the%20Built%20Environment/1410%20Barbara%20Lescher.pdf

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[5] Praeger, p. 52.

[6] Praeger, p. 55

[7] Parager, p. 63

[8] Gershenson, Olga and Barbara Penner. Introduction: The Private Life of Public Conveniences http://people.umass.edu/olga/MyArticles/Ladies%20and%20Gents%20Introduction.pdf

[9] George, Rose. *The Big Necessity: Adventures in the World of Human Waste.* London: Portobello Books, 2008. 60-71

[10] [10] Praeger. pp 84-87, 214.

[11] Most notably the City of Seattle. Six expensive APTs installed at city expense were removed and sold on eBay for $89 each after public outcry that they were being misused for prostitution and drug dealing.

[12] Bill & Melinda Gates Foundation. Website tag line. www.gatesfoundation.org

[13] University of Maryland. Program on International Policy Attitudes. World Public Opinion. ”American Attitudes: American http://www.americans-world.org/digest/global_issues/globalization/values.cfm

[14] U.S. Water and Sanitation AID: Millions of Beneficiaries Reported in Developing Countries, but Department of State Needs to Strengthen Strategic Approach.Government Accountability Office GAO-10-957, a report to Congressional Requesters. September 20101. http://www.gao.gov/new.items/d10957.pdf

[15] “Senate Passes Senator Paul Simon Water for the World Act.” Water and Waste Digest. 24 Sept 2010. http://www.wwdmag.com/Senate-Passes-Senator-Paul-Simon-Water-for-the-World-Act-newsPiece21599

[16] See http://www.gatesfoundation.org/ Tagline appears in header of all pages.

[17] Community-led Total Sanitation is an approach to eliminated opening defecation developed by Kamel Kar. http://www.communityledtotalsanitation.org/

[18] General Assembly GA/10967. 28 July 2010 http://www.un.org/News/Press/docs/2010/ga10967.doc.htm

[19] “Right to Water and Sanitation is Legally Binding, Affirms Key UN Body.” UN News Centre 1 Oct 2010 http://www.un.org/apps/news/story.asp?NewsID=36308&Cr=water&Cr1

[20] Mercy Corps Action Center http://www.actioncenter.org/

[21] Kristof, Nicholas D. “D.I.Y. Foreign Aid Revolution.” New York Times Magazine. 20 Oct 2010. http://www.nytimes.com/2010/10/24/magazine/24volunteerism-t.html

[22] Kiva. http://www.kiva.org/

[23] ONE. http://www.one.org/

[24] 350.org http://www.350.org/

[25] No Child Born with HIV. Video and petition. http://one.org/us/actnow/globalfund2010/

[26] Great Power Race. http://www.greatpowerrace.org/

[27] Send a post card to UK Prime Minister Gordon Brown. http://www.wateraid.org/uk/get_involved/campaigns/take_action_now/7502.asp

[28] Praeger, p. 87

[29] Sustainable Water Campaign http://cascadiagbc.org/action/water

[30] Praeger, p. 89-90

[31] Natural Resources Defense Council. *Swimming in Sewage*. 2004. p. 63.

[32] Praeger, 2007. p. 44

[33] Wikipedia. "Sewage Treatment."

[34] Portland's Bureau of Environmental Services has posted a powerful, stomach-turning video showing a grease clogged pipe. http://www.portlandonline.com/bes/index.cfm?c=50228&a=305760

[35] Food and Water Watch. "What's Lurking in Your Soap?" Fact Sheet. (No date.) http://documents.foodandwaterwatch.org/Triclosan.pdf

[36] "Drugs in Water: Case Study: The San Jose/Santa Clara Water Pollution Control Plant & The Lower South San Francisco Bay." 2010.

[37] Petition,

[38] Ciba Geigy; Corporate Environmental Report, 1993. Quoted in NRDC. Swimming. p. 72.

[39] NRDC. 2004. p. 70.

[40] Earthjustice. "U.S. EPA Proposes New Rule to Control Sewage Sludge Pollution Long-awaited action to reduce a toxic threat doesn't go far enough." Press Release. 4 Oct 2010. http://www.earthjustice.org/news/press/2010/u-s-epa-proposes-new-rule-to-control-sewage-sludge-pollution

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[42] Earthjustice. 2010.

[43] EPA. Combined Sewer Overflows. http://cfpub.epa.gov/npdes/home.cfm?program_id=5

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[51] George. Rose. "Yellow is the New Green" *New York Times* 27 Feb 2009. http://www.nytimes.com/2009/02/27/opinion/27george.html

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