

# **The Central Problem of Our Time:**

## **Cumulative Impacts of Human Economic Activities**

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**These slides are available online at  
<http://tinyurl.com/d5gbco>**

**Part 1:**

**The predicament  
we find ourselves in**

**Cumulative impacts of economic activities in N.J., the U.S. and the world are:**

- \*\* degrading the global ecosystem**
- \*\* damaging human health**
- \*\* ruining the planet as a place suitable for human habitation**

**There are 3 classes of problems caused by cumulative impacts:**

**1. Changes to the oceans and the atmosphere**

**2. Loss of biodiversity**

**3. Contamination of the entire planet with industrial toxicants**

**Big Problem #1:**

**Changing the Oceans  
and the Atmosphere**

## **Some ocean problems:**

**\*\* Acidification**

**\*\* Overfishing**

**\*\* Death of corals**

## **Ocean acidification:**

**Many creatures that require a calcium shell will find (are finding) their shells dissolving, or not forming in the first place. Some of these creatures (pteropods) lie at the bottom of the marine food chain.**

**Corals will be affected, too.**

**Thomas Lovejoy, the executive director of the Heinz Center for Science, Economics and the Environment, says acidification of the oceans is**

**“The most profound environmental change I've encountered in my professional career.”**



**Dr. Lovejoy says, the effects of acidification on ocean life are "shaking the biological underpinnings of civilization."**

**In what ways might healthy oceans be essential for civilization?**

# **Overfishing:**

**\*\* 75% of ocean fisheries are overfished or fully depleted**

**\*\* 90% of the large fish are gone**

**\*\* Humans are fishing lower on the food chain, threatening the integrity of the food chain itself**

**Death of corals –**

**30% of world's corals are dead  
or dying**

**Global warming is expected to  
accelerate this trend**

**“Although [coral] reefs cover a minuscule fraction (0.1%) of seabed, they are second only to rainforests in biodiversity, sheltering or nourishing up to 9 million species -- a third of all known marine life forms -- including 4000 kinds of fish.”**

**--*Science Magazine* May 4, 2007, pg. 678.**

# **Global warming**

**More and larger storms, floods, drought**

**The western U.S., India, China, and Australia are experiencing multi-year drought now.**

**Loss of glaciers means loss of fresh water supplies for at least a billion people in Asia**

**Rising sea levels threaten coastal cities (e.g., N.Y.C., Baltimore, Los Angeles)**

**Big Problem #2:**

**Loss of Biological Diversity  
(or "Biodiversity")**

## **Loss of species in the news:**

**-- Bats dying**

**-- Bees disappearing**

**-- Frogs and salamanders  
declining and disappearing  
worldwide**



**Extinction of species is normal and natural.**

**But we have speeded up the historical rate of extinctions by a factor of about 1000**

**The Millennium Ecosystem Assessment says we will likely lose during this century:**

- 25% of all mammalian species**
- 12% of birds (in the U.S., 30%)**
- 33% of amphibians**

## **The U.N.'s GEO 4 report:**

**Earth has experienced five mass extinctions in 450 million years, the latest of which occurred 65 million years ago.**

**"A sixth major extinction is under way, this time caused by human behaviour."**

## **Big Problem #3:**

**Chemical contamination  
of the entire planet, from the  
tops of the highest  
mountains to the bottoms  
of the deepest oceans**

**At least 62,000 chemicals are now in commercial use, the vast majority untested for health or environmental effects**

**700 new chemicals are put into commercial use each year, almost entirely untested for effects on environment or human health**

**We now have acid  
rain/fog/snow**

**but also,**

**toxicants in rain/fog/snow**

**Pharmaceuticals and  
personal care products  
are now found in all our  
finished drinking water  
(the water you get from  
your tap)**

# **Examples of pharmaceuticals that can be measured in drinking water:**

- \*\* pain killers**
- \*\* anti-depressants**
- \*\* antibiotics**
- \*\* stimulants**
- \*\* heart disease drugs**
- \*\* veterinary preparations**



**Freshwater fish are now essentially all contaminated with mercury, PCBs, and industrial chemicals that mimic, or interfere with, hormones.**

**In all fresh waters, male fish are turning into female fish.**

**N.J. is no exception.**

**We are all exposed to industrial toxicants. The N.J. Department of Environmental Protection has described routine toxic exposures of the citizenry...**

**See handout.**

**Also available at on the web:  
<http://tinyurl.com/2gag37>**

# **New information about toxicants discovered in last 15 years:**

- \*\* Endocrine (hormone) disruption**
- \*\* Fetal programming**
- \*\* Epigenetics**
- \*\* “Body burden” in all animals, especially the top predators, including humans.**

## **Human health:**

**\*\* Asthma is increasing**

**\*\* Diabetes is increasing,  
especially among children**

**\*\* Attention deficit/hyperactivity  
disorders (ADHD) are increasing**

**\*\* Autism spectrum disorders are increasing**

**\*\* Parkinson's disease is increasing**

**\*\* Several kinds of birth defects are increasing**

**\*\* Childhood cancers are increasing**

**And all of these health problems are worse among communities of color and communities of low income.**

**See handout.**

**And: <http://tinyurl.com/2ttby4>**

**The U.N.'s GEO 4 report says:**

**We are currently using 54 acres per person (worldwide), but the earth can only provide 39 acres.**

**We have exceeded Earth's "carrying capacity."**

**It is possible to exceed the Earth's "carrying capacity" temporarily but the result is permanent degradation of the global ecosystem.**

**For example, soils can be forced to produce more crops, but eventually they become exhausted – a loss borne by future generations.**



**The Global Footprint Network estimates that the human economy is currently exceeding Earth's sustainable capacity by 20%.**

**In other words, to live sustainably with our present numbers in our present lifestyles, we humans would now require 1.2 planet earths**

**If everyone on Earth lived the way we in the U.S. live, humans would require six planet Earths.**

**There are one billion teenagers alive today (ages 13 to 19).**

**Human population is expected to increase 35% in the next 40 years (from 6.7 billion to 9 billion).**

**The human economy is poised for a new period of rapid growth, at least 3% per year, thus doubling every 23 years.**

## **Millennium Ecosystem Assessment:**

**Of 24 ecosystems studied worldwide, 60% are being degraded by human activities.**

**"We're undermining our ecological capital all around the world," says Robert Watson, chief scientist of the World Bank.**

**When the Millennium Ecosystem Assessment was released in 2005, the Board of Directors of the study issued this statement:**

**"At the heart of this assessment is a stark warning. Human activity is putting such strain on the natural functions of Earth that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted."**

**In sum:**

**The cumulative impacts of our economic activities are ruining the planet as a place suitable for human habitation.**

**We are wrecking our only home.**

**Part 2:**

**How did we get into this predicament?**

**And what can we do about it?**



**To stop the degradation of the ecosystem and restore human health, we will need to change the rules by which society makes decisions.**

**Our present way of making decisions developed during the 19<sup>th</sup> century, when the world seemed limitless.**

**Now that we are approaching (in many cases exceeding) ecological limits, our decision-making rules need to adapt to new conditions.**

**See: <http://tinyurl.com/b6fptc>**

**Two aspects of our laws need to change:**

**First, our legal system is set up to promote perpetual economic growth.**

**The law presumes that the benefits of economic growth always outweigh the costs, until a specific cost-benefit analysis shows otherwise.**

**Even when an economic activity is causing obvious harm, the burden of proof rests on those who want the activity modified or stopped.**

**They must show that the costs (harms) are “unreasonable,” meaning the costs to society of the activity outweigh the benefits that the activity creates.**

**Proving that costs exceed benefits is a difficult burden to meet because the necessary information about costs and benefits is often not readily available and the proponents of an activity are under no obligation to provide the needed information.**

**Importantly, when we have scientific uncertainty or doubt, or the absence of information, the law defaults to its starting presumption:**

**Economic activity is presumed to provide net benefits (more benefits than costs) and so the law presumes that the activity should continue.**

**This is the main reason why the environmental movement has failed to stem the tide of ecosystem degradation despite 35 years of heroic effort.**

**As you can see, the legal and regulatory systems reward ignorance, uncertainty and doubt.**

**There is now a very substantial industry devoted to the manufacture of scientific uncertainty and doubt.**

**See: David Michaels, *Doubt is Their Product* (2008).**

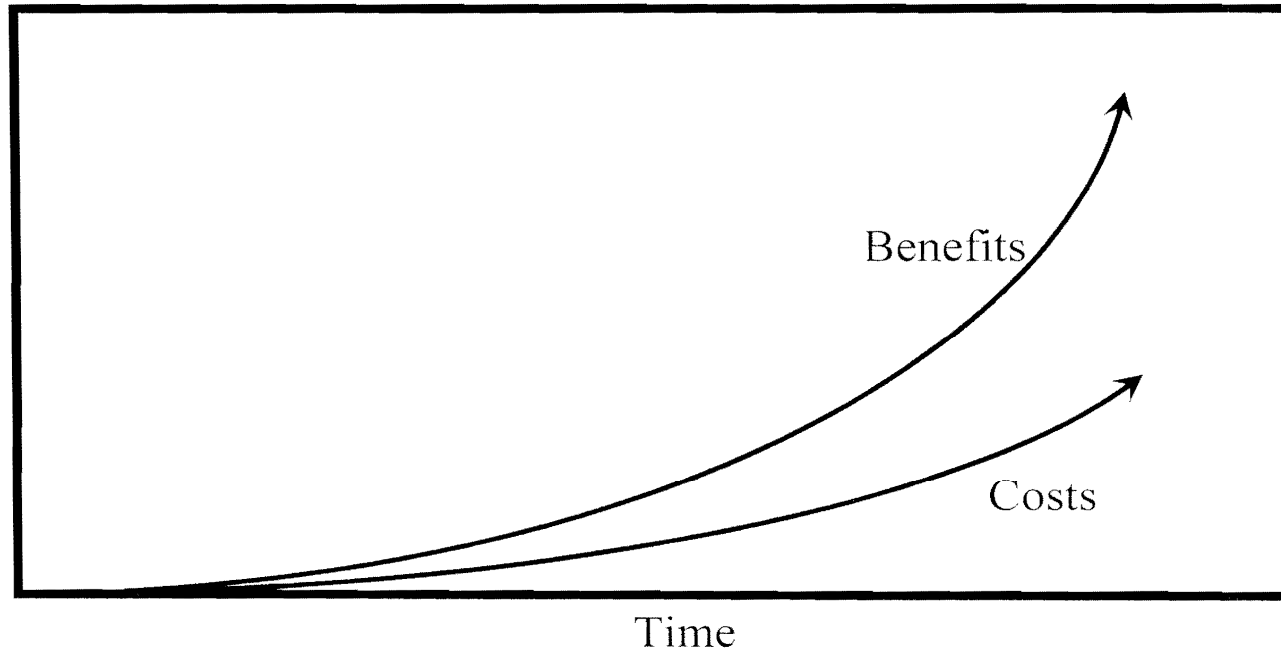


## **The second change needed:**

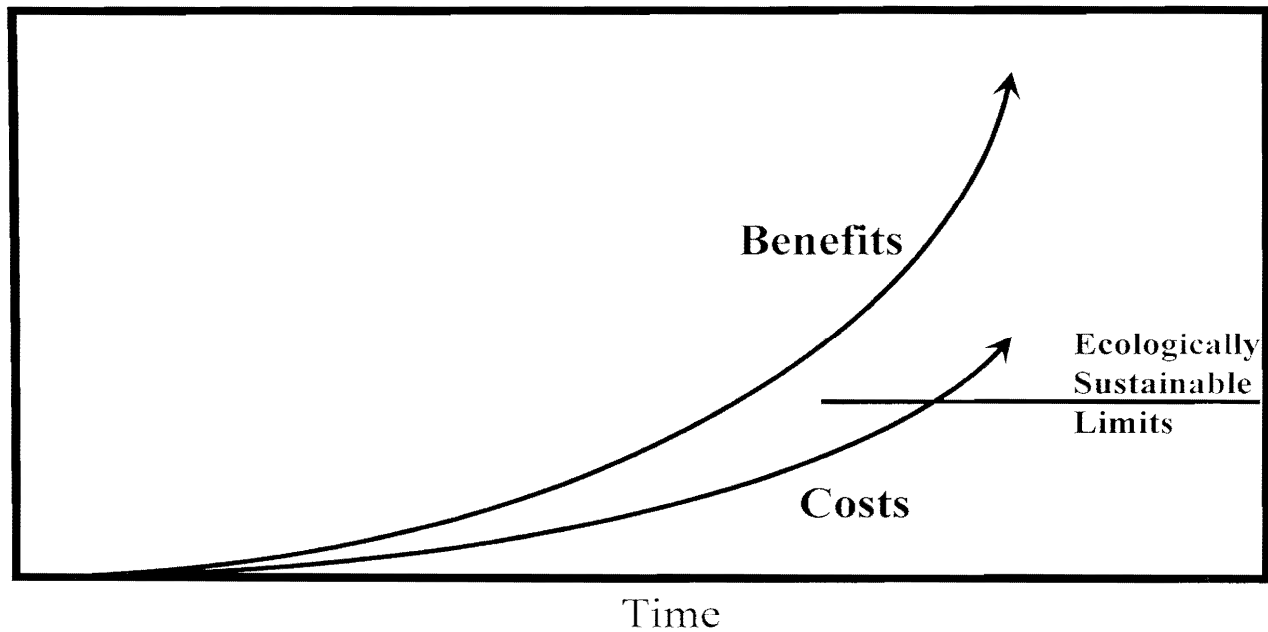
**The law presumes that economic benefits and their related costs can grow forever, without limit, as if the Earth's capacity to absorb harm is infinite.**

**This is a crucially important (though incorrect and unscientific) assumption built into our laws.**

**The Law Assumes:  
Both Benefits and Costs Can Grow Forever**



## Cumulative Environmental Costs Can Surpass The Earth's Ecologically Sustainable Limits



**This is why cumulative impacts are the central problem of our time.**

**They are ruining the Earth as a place suitable for human habitation, yet the law fails to acknowledge that ecological limits exist and can be breached by cumulative impacts.**

**Why is this important?**

**So far as anyone knows, the Earth is the only place in the universe hospitable to human life.**

**If the Earth is our only home and our cumulative impacts are reducing its capacity to support human life, then we run the risk of an infinite loss – losing our only home in the universe.**

**Under these circumstances, justifying additional costs (harms) by balancing them against benefits no longer makes sense.**

**Under these circumstances, cost-benefit analysis ceases to provide sound scientific guidance for policy.**

**We are living in a new world, one that is approaching or exceeding ecological limits (which, in turn, is causing chronic human diseases to increase).**

**Therefore, we need new rules for making decisions.**

**We need to shift the overarching goal of our legal system from**

**Promoting economic growth**

**to**

**Protecting the integrity of the global ecosystem**



**Specifically, we need to abandon cost-benefit decision-making and examine every decision that can impact the ecosystem (or human health) through the lens of the precautionary principle.**

# **The four main ideas of the precautionary principle:**

**1. If we have evidence that harm is occurring or is about to occur, we have a duty to take action to prevent harm.**

**2. We must shift the burden of proof to the proponents of a new product or project. It is up to them to show...**

**(a) That their activity is being conducted in the least-harmful way possible; and**

**(b) That their activity will not degrade the ecosystem or human health.**

**3. Because of uncertainty, after we make a decision, we must always monitor carefully and be ready to alter course. Therefore, we should avoid irreversible decisions and irretrievable commitments.**

**4. We should engage the public  
– really engage them – in decisions  
that affect their lives.**

**Wisdom and authority reside  
in the citizenry, not with the experts  
(though of course experts have  
a role as advisers).**

**Using a precautionary approach, uncertainty, scientific doubt and missing data become reasons to take precautionary action and to not just press ahead assuming that benefits will outweigh costs.**

**Cost-benefit analysis (and risk assessment) ask, How much harm is acceptable?**

**Precautionary action asks, How much harm is avoidable?**

**You may hear that the precautionary principle is vague, because there are many ways to define it. This not true.**

**In EVERY definition of the precautionary principle, there are three common elements:**



**1. When we have reasonable suspicion that harm is occurring or may occur**

**2. and we have scientific uncertainty**

**3. then we all have a duty to act to prevent harm.**

**The precautionary principle  
does not tell us what action  
to take.**

**But advocates for the  
principle have suggested the  
following...**

# **Eight kinds of precautionary action we can take:**

**1. Set goals (dream, then plan)**

**2. Engage the affected people in decisions; really engage them**

**3. Reverse the burden of proof.**

**Assume that any action that affects the biosphere will be harmful, until proven otherwise.**

**In other words, give the benefit of the doubt to nature and to public health. It is not up to the public to prove harm.**

**It is worth pointing out that we already take this approach with new pharmaceutical products.**

**New drugs are assumed to be harmful or useless or both until the drug company can prove both safety and efficacy**

**4. Examine all available alternatives for achieving the goal(s) and select the least-harmful way.**

**5. Consider all the evidence (no cherry-picking data, no ignoring inconvenient facts)**

**6. After a decision is made,  
monitor carefully (no sleep-  
walking)**

**7. Heed early warnings**

**Be prepared to alter course  
based on monitoring results.**

**8. Acknowledging that we may need to alter course implies that we should avoid irreversible decisions and irretrievable commitments**



**Precaution is not anti-science.**

**Rather than "overriding" science and data, this principle explicitly acknowledges the central role of scientific data (and scientific doubt) in decision-making.**

**Cost-benefit balancing for decisions is unscientific because it ignores the thousands of studies that show that ecological limits can be exceeded by the cumulative impacts of costs that are justified by benefits.**

**We all use the precautionary principle every day in our own lives.**

**For instance, we may grow our own food, or buy organically grown food, because of the risk from pesticides.**

**Even though we don't know everything there is to know about pesticides and our health, we take precautionary action (grow or buy organically grown food) to avoid unintended consequences (getting cancer or other diseases).**

**Where did the precautionary principle come from?**

**Precaution grew out of grass-roots activists identifying problems -- chemical dumps, Superfund sites, polluted wells, polluted rivers, fish too toxic to eat, leaking landfills, radioactive waste, pesticide poisonings, sludge dumped on land, toxic waste left in poor communities and communities of color, rising disease rates, and so on.**

**Precaution came from activists  
opposing risk-based decisions.**

**Risk assessment asks, How  
much harm is acceptable?**

**Precautionary action asks, How  
much harm is avoidable?**

**Precaution developed in response to big mistakes of the past -- lead in gasoline and in paint; pesticides; destruction of the ozone layer, global warming...**



**Precaution comes directly from the central principle of public health: primary prevention**

**Precaution derives from the guiding principle of clinical medicine: first do no harm**

**Precaution comes from the German *vorsorgeprinzip*: the principle of foresight or forecaring**

**The European Union adopted the precautionary principle in its founding document (The Maastricht Treaty of 1990)**

**Precaution comes directly  
from your grandmother:**

**\*\* look before you leap**

**\*\* better safe than sorry**

**\*\* a stitch in time saves nine**

**How is the  
precautionary principle  
being used?**

**Many cities and a few states now take a precautionary approach to pest management in schools, playgrounds, parks, and public buildings. They have passed laws and regulations specifying that chemicals will be used only as a last resort, after all other alternatives have been tried.**

**Many cities in Canada have passed ordinances prohibiting the use of pesticides on lawns for cosmetic purposes.**

**The Supreme Court of Hawaii has ruled that the state must manage Hawaii's water resources using the precautionary principle, aiming to avoid harm to the resource, which the state holds in trust for present and future generations of Hawaiians.**

**Many nations (and a few states in the U.S.) have adopted a precautionary approach to the management of fisheries, to avoid harm from overfishing, habitat destruction, and pollution.**



**The City and County of San  
Francisco have adopted  
precaution as overarching  
governmental policy,  
guiding all their decisions**

**The Township of Lyndhurst, N.J.  
adopted the precautionary  
principle in 2008 to guide all  
municipal policies**

**Read about it here:**

**<http://tinyurl.com/cc5wod>**

**Several towns in rural Pennsylvania have taken a precautionary approach to local public health and corporate power: they have passed local laws prohibiting corporations from farming, mining, and putting sewage sludge on land, among other things.**

**A model precautionary state law is available. It takes into account both the precautionary principle and the need for justice and fairness in decisions:**

**<http://tinyurl.com/6qdbt8>**

**Using a precautionary approach,  
whenever we make any decision  
affecting the ecosystem or human  
health or community well-being  
(including fairness and justice),  
we can do seven things:**

**1. Consider all reasonable alternatives (including the alternative of doing nothing) with the intention of adopting the least harmful way**

**2. Shift the burden of proof:  
people making changes that affect  
the public or the ecosystem  
should have to provide reasonable  
evidence of no harm (just as drug  
companies must provide evidence  
that their drugs are reasonably  
safe before sale).**

**3. Consider the cumulative effects of this decision with previous decisions**

**Do not take actions or make decisions in isolation**



**4. Consider the effects of our actions on seven generations.**

**We can appoint an official guardian of the future to help decision-makers think about the long-term consequences of their decisions.**

**5. Give state government and local governments and affected neighborhoods the right to say "No" to projects they deem harmful to human health, the environment, or community well-being (just as they already can say "No" to liquor stores or pornography shops).**

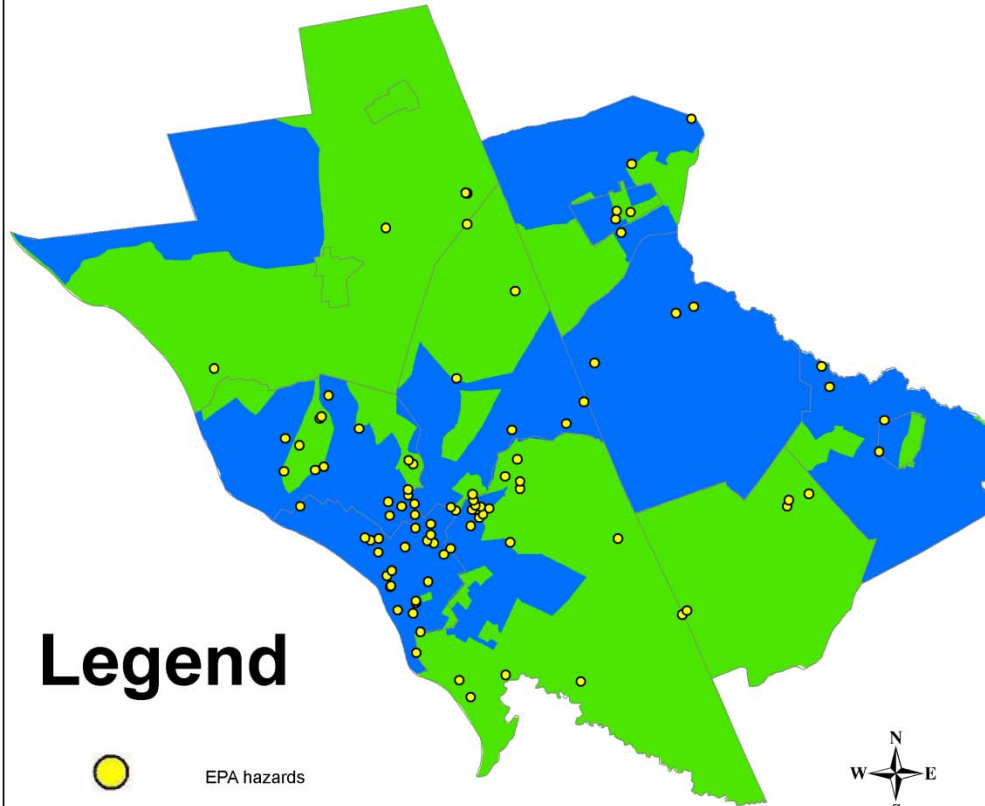
**6. Consider how fairness and justice will be affected by every decision. Ask,  
who will get the benefits?  
Who will pay the costs?  
Who will be harmed?**

**7. Take into consideration  
the effects of decisions on  
burdened and vulnerable  
populations**

## **More Burdened:**

**Living in cities, with air pollution from traffic, deteriorated housing, toxic lead in the soil of play grounds, with housing built on or near toxic industrial sites, etc.**

# Percent People of Color and EPA-reported Environmental Hazards (n = 94) in Mercer County, N.J.



## Legend

 EPA hazards

### % People of Color

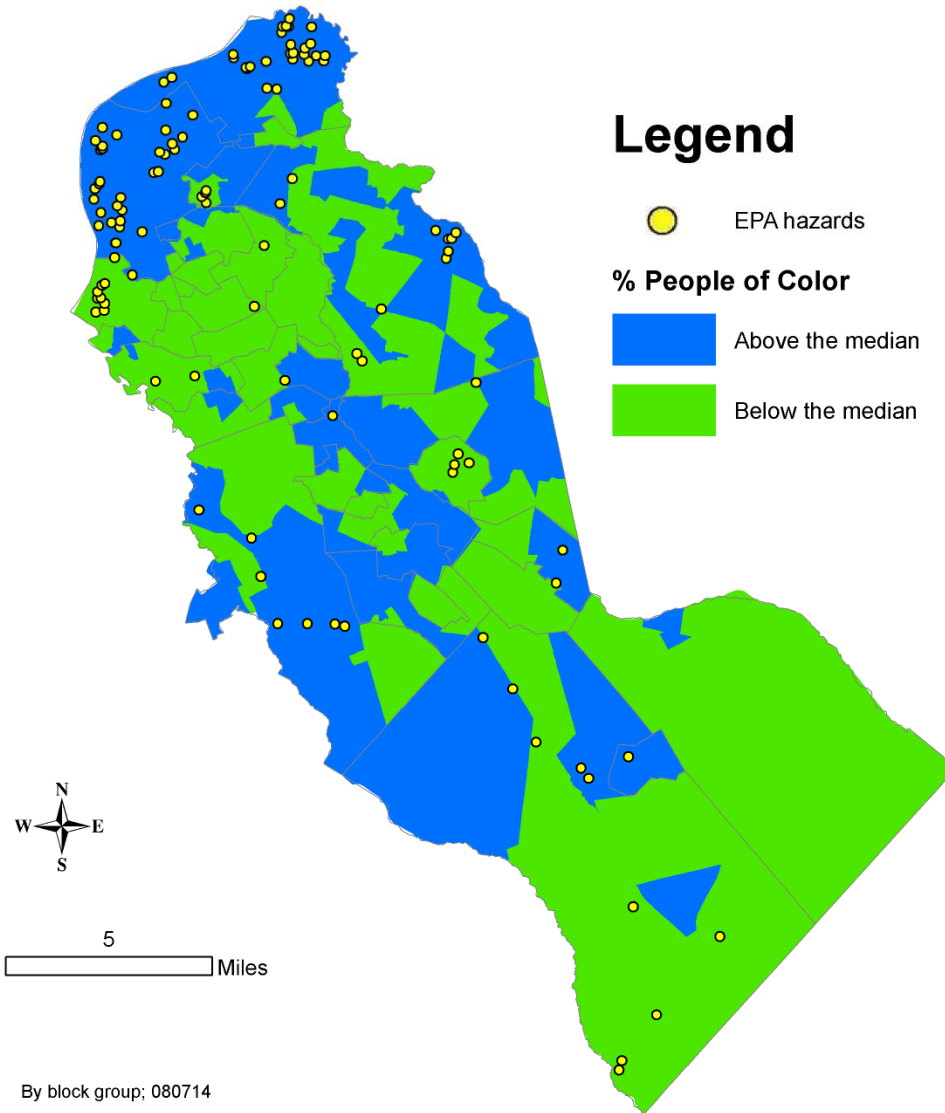
 Above the Median

 Below the Median

8 Miles

By block group; 080715

# Percent People of Color and EPA-reported Environmental Hazards (n = 117) in Camden County, N.J.



## **More Vulnerable:**

**Higher rates of pollution-related disease (cancer, diabetes, asthma, etc.); more stress from racism, joblessness, etc.**

**Low income = more people without health insurance, less access to healthy food, etc.**



**In New Jersey, Blacks and Hispanics fare worse than Whites on measures of asthma, diabetes, cardiovascular disease, infant mortality, and several kinds of cancer (including breast, cervical, colorectal, and prostate).**

**For more data, see the handout.**

**And: <http://tinyurl.com/2ttby4>**

**So there you have it:**

**The precautionary principle is  
a new way of making  
decisions for a new time.**

**These days, when it sometimes seems as if the future itself is endangered, precaution offers us a way forward.**

**Precaution offers us hope.**

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