NNOCCI National Network for Ocean and Climate Change Interpretation

Overview of Navigating the Swamp – Using Cultural Models

SCIENCE: RELATED CULTURAL MODELS

Cultural models related to science and scientists are often used by the public as they respond to information about the environment. The science domain involves a range of cultural models that can help or hinder communication about climate science.

Curiosity and wonder

This model positions scientific disciplines as having a unique way of understanding the natural world, almost as if they have a VIP pass into a theater filled with the wonders of the universe. When thinking through this model, scientists are viewed as helpful, knowledgeable guides to the natural world, able to explain mysterious but interesting phenomena, and science is seen as a source of information that can satisfy human curiosity about the world.

Science will save us

This model links science with the discovery and invention of things that make life easier and solve problems both big and small. This association can be productive: when people are in the mindset that new technology has helped solve difficult problems in the past and therefore can be applied to come up with solutions to climate change, they can easily imagine that the problem has a solution and is therefore worth their attention. However, thinking of science as a source of solutions might also lead to disengagement and disempowerment by distracting attention from average citizens' responsibility to be part of the solution. Explanations of high-tech innovations can seem inaccessible to the public, and it's a short leap from there to place responsibility for solving the problem on researchers, government, or industry. Or, trusting that a solution will emerge from science, people may reason that there is no real danger in postponing meaningful action – something better will come along just in time, never fear.

How do scientists know that?

This cultural model involves thinking of science as a complicated activity only carried out by scientists or others with special training. This model isn't necessarily unproductive; when 'how do scientists know that' is a genuine question, it's compatible with the desire to learn more and understand the nature of current research and its findings. However, it is a model that also makes it easy to be skeptical of scientific claims. If scientific activities remain opaque, or if the process by which scientific conclusions were arrived at remains mysterious, then people thinking from this model develop a sense of distrust. The line of reasoning goes something like this: "If I can't understand *how* you know it, then I have no reason to believe *that* you know it."

New study every week

This model involves the sense that credible sources stick to their stories and get their facts straight before making public statements. This model, which is a fairly useful rule of thumb in everyday interpersonal relationships, is problematic when applied to science, which follows an iterative, incremental process of inquiry. Reasoning from this model, scientists seem like unreliable sources, because they seem to always be announcing a new finding – maybe even ones that contradict prior findings. This model makes it easy to be skeptical of scientific claims, no matter how well supported, because the source itself is under suspicion. Reasoning from this model can also lead to the conclusion that 'the jury is still out' on the existence, extent, or consequences of climate change, and so it's not yet time to act.

Predictions are just guesses

This model involves the idea that the future is unknowable, and any attempts to make predictions are educated guesses at best, and fortune-telling at worst. When thinking with this model, the public treats scientific predictions with skepticism. They may even question the motivations of those making the predictions: palm-readers aren't after the truth, they're after your money, and by analogy, this model makes it easy to imagine that scientists have a political agenda that overrides neutral, value free scientific methods. In this mindset, previous instances of predicted ecological catastrophes which failed to materialize are easy to recall and serve as cautionary tales against taking scientific gloom-and-doom too seriously.

PUBLIC AFFAIRS: RELATED CULTURAL MODELS

Cultural models related to public affairs (government, politics, and civic life more broadly) are often used by the public as they respond to information about the environment. This is especially so in the absence of a clear understanding of the basic mechanism of climate change: if it can't be understood as a scientific process, then people turn toward understanding it as a political issue. Depending on which models in this domain are activated, thinking from these models can go in several different directions: it can lead the public to disengage from the issue, to gravitate toward individual solutions, or to embrace the possibilities of broad scale solutions.

Civic responsibility

This cultural model holds that civic participation and social action are duties of every citizen. 'Dialogue' is central to Americans' concept of civic responsibility; when thinking from this model, people see themselves as responsible for 'being informed' as well as for informing others by sharing their perspectives in public forums, reaching out to public representatives, etc. Attention to the public interest – thinking beyond individual interests – is also viewed as part of being a responsible citizen. This model also holds that citizens can and should take reasonable measures to align civic institutions with the dictates of their conscience; actions such as voting and protesting flow from this line of thinking. This cultural model offers many highly productive entry points for engaging the public in productive discourse on climate change.

We can do it!

An important cultural model related to public affairs involves the idea that America is a can-do, problem-solving nation. It associates American culture with characteristics such as determination, courage, intelligence, practicality, cooperative spirit, and inventiveness. When thinking through this model, people can easily imagine that there is no problem too big for us to solve, and express faith that even if no solution is apparent at the moment, American ingenuity and technology will arrive at a solution. The model also emphasizes the necessity of collective action and cooperation: 'coming together' solves big problems. This cultural model offers many highly productive entry points for considering ways to address environmental challenges.

Oceans are a public resource

People think of the oceans as a quintessentially public resource – something to be shared by all, something not owned by any one individual, and something that deserves and demands collective caretaking. This model can lead the public to support policies and regulations that maintain and protect ocean and climate systems.

Government is good at protection

This model holds that one of the primary purposes of government is to provide 'protection,' and that all things considered, this is something that government is actually pretty good at. Once thinking of government as 'protector,' the public can go in different directions, some productive and some less so. On one hand, people thinking through this model trust in the government to protect citizens from major threats to health, safety, and wellbeing. They expect, and may even demand, that government play an active role in identifying and mitigating threats. This mindset makes it easy to support policies and regulations that maintain and protect ocean and climate systems. On the other hand, the notion of government as protector can combine with notions of government as ineffective or unresponsive, which then makes it easy to fear that government is protecting the environment at the expense of some or all people. This line of thinking makes it much more difficult for people to reasonably engage in consideration of public policy solutions.

Politics as usual

Cultural models about the 'broken' political system are strong and deeply unproductive. Negative associations with politics include corruption, mismanagement, inefficiency, incompetence, and inertia. In this model, politicians make decisions based on their own self-interests, not the public interests; profit and political pandering are their top motivations. In this model, change is unlikely to occur because of gridlock and partisan bickering; if something does get done, it's probably the wrong thing. Once thinking about climate change in terms of 'politics as usual,' people may conclude that the problem can't or won't be fixed. It then makes sense to disengage, or settle for the solutions that they can implement themselves.

Two sides to every story

This model of fairness holds that in political discourse, each perspective deserves an equal hearing. While this model doesn't necessarily cause people to agree with climate change skeptics, it does lead them to the sense that the issue is a topic of debate and everyone is entitled to their opinion. A similar but more cynical model is 'political football' - the sense that climate change is just another political issue in which partisan ideology substitutes for facts and 'truth.' If neither side is trustworthy, then it makes sense to ignore public discussion of the issue altogether. When trying to communicate information that is supported by overwhelming evidence and scientific consensus, these 'back and forth' models can be significant cognitive obstacles.

CONSUMERISM: RELATED CULTURAL MODELS

The public can easily connect oceans to human lives as a source of resources that humans can buy, sell, and consume. Because a consumerist perspective focuses people on thinking about what is in the oceans - namely fish and what they need to survive – this line of thinking isn't entirely incompatible with an ecosystems perspective. In general, however, the cluster of cultural models that evidence a consumerist or economic logic obscure productive thinking about changes necessary to restore balance and stability to the climate and oceans.

Ecosystems are valuable resources

This model involves recognition of the practical and economic utility of ecosystems. When applied specifically to oceans, public thinking recognizes that people around the world rely on fish as a major food source, and that the oceans are used to transport goods around the world. A *recessive* (less common or less easily brought to mind) version of this model involves the belief that the ocean contains other substances important to human lives that may be little known, or yet to be discovered. People recognize that without a reasonably healthy ocean, we would lose highly valuable resources we use to meet our needs. Thinking from this model, the public readily recognizes that protection and conservation are important to sustain current ecosystems.

Cost-benefit thinking

This model holds that a wise way to make decisions is to weigh the 'pros' and 'cons' – a model of decision-making borrowed from business practices. This model can allow for productive conversation on climate and ocean change: humans have a vested interest in sustaining ocean systems, and the impacts of climate change come with measurable and observable costs. On the other hand, it cost-benefit thinking can also set up unproductive reasoning. People are psychologically predisposed to place a higher value on immediately realized costs/benefits than on intangible or delayed costs/benefits, so the economic gains of today are routinely prioritized over the losses, natural or economic, of tomorrow. To give another example, because this model requires identifying the 'upside' to every event, the public can draw some unfortunate conclusions about bycatch, an environmentally detrimental consequence of irresponsible fishing practices. In the cost-benefit way of thinking, the idea that nothing should be wasted emerges; and from there, it makes sense to suggest that the solution is to find a market for everything that is caught.

Zero-Sum: Jobs vs. environment

Zero-sum thinking is a cultural model that attaches to many societal dilemmas: in situations involving conflict or competing interests, there must be one winner and one loser; for every gain, there must be a loss; there is only so much to go around, so some will be 'haves' and others 'have-nots.' This line of thinking makes it difficult to envision win-win situations and can cut off the quest for cooperative, rather than competitive, resolutions. In the context of climate change and oceans, zero-sum reasoning places humans on one side and nature on the other. One of the most prominent versions of this model is *jobs vs. environment.* In this way of thinking, people conclude that they must choose between economic benefits and environmental preservation: jobs *or* the environment, but not both. By forcing people to choose between the immediate interests of humans and the interests of creatures that live in the ocean, the economic frame downplays the value of interdependence. When thinking in this mode, people reason that the only solution is sacrifice, or to stop eating seafood. Not only are these difficult solutions to embrace, they don't address the root causes of climate change.

Bottomless grocery store

This model builds on the notion of oceans as vast, invincible, and inexhaustible – adding an economic fantasy of limitless supply, capable of meeting infinite demand. People find it exceptionally difficult to imagine that the ocean could possibly run out of resources. When reasoning from this model, it's hard to imagine why policies designed to protect marine species are necessary.

Eat it while you can!

This cultural model works from the premise that 'supplies are limited, so act now.' It recognizes the possibility that certain species may become endangered or extinct, but focuses in on a single implication for humans - the fact that disappearing fauna will no longer be available for human consumption. In this consumerist model, the appropriate response to scarcity is to consume more quickly: after all, smart shoppers get the good stuff before someone else does. There is also an element of resignation to the inevitability of species loss; in economic logic, the unavailability of certain goods is to be expected from time to time.

CLIMATE CHANGE: RELATED CULTURAL MODELS

Something needs to be done

This widespread model connects to a shared cultural belief that problems that receive a great deal of public attention (through media, politics, etc.) deserve to be addressed – somehow, at some point, by somebody. People readily believe that environmental degradation is occurring; this fits in with an overarching cultural narrative about human activities destroying the earth. When it comes to climate change, most are of the opinion that it is real, happening now, and caused by human activity. People are concerned about its impacts, and because of our shared belief that acknowledged problems demand solutions, they feel some sense of urgency for movement on the issue.

Its weather

Climate and weather are closely connected, even conflated, in the public mind. Beliefs about weather include the view that weather is the quintessential 'act of God,' completely out of the control of humans. Other associations that come along with weather thinking include a perception that a degree or two in temperature is insignificant; and that because weather cannot be accurately predicted more than a few days in advance, then long-term climate predictions are suspicious at best. These entailments are all obvious roadblocks to understanding the scientific consensus, and suggest that climate science communicators must tread carefully when connecting weather to climate change. However, the immediately observable, and intrinsically interesting, and "everyday topic of conversation' nature of weather can also be harnessed to set up productive conversations about climate change. Destabilized weather patterns are the most tangible impact of climate change experienced by most members of the public, and so can be a concrete way to connect citizens to the impacts of the change in process.

What can I *really* do?

This cultural model has two sides: on one hand, it involves a sense of responsibility to do something about social problems; and on the other, the sense that the problem is too big, too far advanced, or just too entrenched to be solved. The model also involves the assumption that because it is "human nature" to do things that harm the earth, environmental problems are inevitable and cannot be stopped. Moreover, because our society is structured in ways that make it difficult to reduce personal consumption of fossil fuels, the feeling that the problem is too hard to solve is reinforced. People thinking from the 'what can I *really* do?' model may feel both a sense of personal responsibility and a sense of futility or inadequacy. They may gravitate toward general 'earth-friendly' solutions, such as using fewer resources, recycling, or donating to environmental causes, but feel like this still isn't enough; or they may throw their hands up and determine that nothing can be done, but still feel a sense of concern or worry. To make this model productive, communication strategies must carefully pull forward the desire to help, and push to the background the sense that the help won't make a difference.

Big, scary, depressing

This cultural model associates the topic of climate change with enormous, and enormously distressing, problems: images of emotionally disturbing outcomes such as starving polar bears; frightening events such as flooding, fires, or hurricanes, and vague but vast outcomes such as 'the end of the world' or general global chaos. When thinking through this model, climate change ceases to feel like a specific problem with specific solutions. This crisis-laden model can lead to people to disengage from the issue to avoid unpleasant emotions.

My observation is as good as yours

This model revolves around the idea that the state of the climate is revealed through weather and other natural phenomena that average people can observe and judge for themselves, and that personal observations are as valid and reliable as scientific descriptions of trends. In this way of thinking, counter-examples call generalizations into question. For example, according to this logic, a colder-than-usual winter provides firsthand, and therefore irrefutable, evidence that 'global warming' isn't really taking place, or at least that it isn't as serious and widespread as others assert.

Political football

This model consists of the belief that climate change is just another political issue in which partisan ideology and 'spin' substitutes for facts and 'truth.' If neither side is trustworthy, then it makes sense to ignore public discussion of the issue altogether. This model is associated with and reinforced by assertions of climate science hoaxes. When thinking from a 'political football' model, people tend to align themselves with the position on climate change espoused by 'their side,' and are typically closed to productive discussion.

It's about the ozone isn't it?

While the public is concerned about climate change, there is widespread confusion about the underlying mechanism and the current and expected impacts. A very common misconception is that climate change is related to the hole in the ozone layer – for instance, that global temperatures are rising because too much sun, or harmful sun rays, are coming in through the ozone hole. Because people believe that excess heat comes in through a hole in the ozone, they reason from there that the solution is to plug the hole in the ozone, stop using CFC's, or that the problem has already been solved. Thinking this way makes it difficult to connect the relationship of fossil fuel use to climate change.

PROGRESS: RELATED CULTURAL MODELS

Cultural models of how progress unfolds are often used by the public to think through environmental issues. Progress in itself is simply the idea of moving forward in either space or time. Societal progress is closely associated in the public mind with the idea of modernization and a continuous improvement and expansion of technology. This "juggernaut of history" is generally viewed as a positive, desirable aspect of human experience, but an unquestioning acceptance of all aspects of modern life can make it difficult for people to consider the large-scale changes that are needed to reduce fossil fuel emissions or attend to other shifts necessary to address climate and ocean change.

Americans are problem solvers

This model involves the idea that America has progressed as a nation largely because we tackle, and overcome, challenges that arise. It associates American culture with characteristics such as determination, courage, intelligence, practicality, cooperative spirit, and inventiveness. When thinking through this model, people can easily imagine that there is no problem too big for us to solve, and express faith that even if no solution is apparent at the moment, American ingenuity and technology will arrive at a solution. The model also emphasizes the necessity of collective action and cooperation: big problems are solved by 'coming together.' This cultural model offers many highly productive entry points for considering ways to address environmental challenges.

Can't go back

A key part of the story of modernization is the idea that progress moves ever-forward; its momentum is unstoppable and is outside of our voluntary control. When applied to thinking about climate change, this model can obscure possibilities for change. This model doesn't allow people to easily discriminate between desirable changes and undesirable changes: everything is moving forward whether we like it or not. Thinking through this model, people are resigned to both positive and problematic changes and disinclined to engage in influencing outcomes. Climate change is a consequence of progress and therefore unavoidable. This model can also lead people to resist changes that are viewed as attempting to turn back the clock, and from there, resist any initiatives at all. If they come to the conclusion that the only ways of halting environmental degradation require society to "go back" to earlier times (pre-industrial times) – a "solution" that is both undesirable and impossible – then taking action on climate change doesn't make sense.

Comes with costs

This model involves the belief that progress is never an unqualified good: it always comes with costs. (An example of this model in action related to progress on another issue is the common observation that while society has benefited from women entering the workforce and this change represented desirable progress, society also lost something because mothers are no longer at home to care for their children.) Once in this mindset, people conclude that bad environmental consequences are simply the price society must pay for progress. Thinking from this model, impacts on animals and ecosystems that might otherwise be considered unacceptable become mere 'collateral damage' on the path toward the future.

There are winners and losers

Models of progress include the zero-sum thinking idea that only some, not all, can share in the benefits of progress; progress involves someone winning, and someone losing. Zero-sum thinking is a cultural model that attaches to many societal dilemmas: in situations involving competing interests, there must be one winner and one loser; for every gain, there must be a loss. This line of thinking makes it difficult to envision win-win situations and can cut off the quest for cooperative, rather than competitive, resolutions. In the context of climate change and oceans, zero-sum reasoning typically places humans on one side and nature on the other. Combine zero-sum thinking with other beliefs about progress and If progress is essential, unstoppable and good – but only allows one winner – then developed nations must 'win' and the third world must 'lose'; humans must 'win' and animals and ecosystems must 'lose.' This model, in addition, absolves the 'winners' from responsibility for the consequences that 'losers' experience: that's just the way that progress works.

OCEANS: RELATED CULTURAL MODELS

A shared public resource

People think of the oceans as a quintessentially public resource – something to be shared by all, something not owned by any one individual or nation, and something that deserves and demands collective caretaking. This model, which holds that the ocean "belongs to everyone," helps to explain negative attitudes toward private beaches, and the sense of shared affront that emerges after highly publicized ocean oil spills. This model can lead the public to support policies and regulations that maintain and protect ocean and climate systems.

Oceans support humans

People understand that oceans support human life by meeting needs for food, transportation, and work. This model also includes the idea that it is a uniquely valuable resource: there are things we rely on from the ocean that are not available elsewhere on the planet. Thinking in this mode, people understand that the oceans are a vital aspect of the earth's systems, and they can easily grasp why ocean systems must be maintained.

It's all connected

People feel connected to the oceans as part of the earth's overall ecosystem. This way of thinking includes the view that people and the ocean exist in a single interdependent system. This model helps people to focus on the ways the oceans and human lives are interdependent.

A special, beautiful place

One of the strongest models related to oceans involves the sense that the ocean is an especially beautiful place, and provides a special setting for human recreation and pleasure. This model is revealed by peoples' tendencies to express longing for time near the ocean and spontaneously share memories of seaside vacations. This mode of thinking ascribes the ocean with the power to affect humans' mental states: it is calming, relaxing, and even healing; it can provoke spiritual awakening. These positive associations with the ocean can allow for productive conversations about ocean preservation and protection, as people thinking in this mode are motivated to keep oceans available for human use. However, this model can also obscure any thinking about the ocean beyond the beach. It clouds out thinking about marine life and ecosystems, as attention is focused primarily on where the sea meets land. It doesn't necessarily lead to accurate reasoning about the problems oceans face and the types of solutions most likely to effectively address those problems. It's also a one-way model that emphasizes how the ocean affects humans, with little room for considering how humans affect the ocean.

A different world

This model involves the idea that oceans are not like land. People think of them as a different world, even an alien world, one too vast and mysterious for people to understand. This way of conceptualizing oceans disconnects human experience from life on and in the oceans. When thinking in this model, it's easy to assume that different standards and rules apply to the ocean than to land. It's also easy to disengage from thinking or learning about the ocean – what's it got to do with me?

Drop in the bucket

The vastness of the ocean structures thinking in some interesting ways. On one hand, it's easy to conclude that the ocean is too large to truly harm; any damage we might inflict is just a 'drop in the bucket.' People assume the ocean will spread out the effects of climate change because it is big enough to absorb the impacts. On the other hand, it's also easy to think that if the ocean has a problem, it's too big to fix. When thinking from the model of how large the ocean is, the public has a hard time considering processes and systems; they've already stopped at the idea that the ocean is too big and complex to understand.

Heal themselves

This model involves the idea that the ocean can repair any damage via "natural cycles." In this line of thinking, any pollutants that people put in the ocean will be washed away in time.

All on the surface

Many people have trouble thinking about the ocean, especially the open ocean, as containing ecosystems within it, or currents and other mechanisms that affect the atmosphere, weather and life on land. People habitually conceive of the ocean at a surface level. They imagine things like recreation (boating, fishing, beachcombing, surfing), gazing at the ocean, but never under the surface. All on the surface thinking generally prevents people from thinking in terms of interconnected systems, or humans' relationship to the oceans.

NATURE: RELATED CULTURAL MODELS

We need to take care of it

This widely shared and deeply ingrained cultural model holds that nature is important and valuable, and that humans have a duty or responsibility to take care of it. This model allows for productive thinking and talking on climate change and oceans.

Shared fate; one big web of life

This model holds that humans, like other species, are part of nature. All natural life is conceived of as complexly interconnected, like a web. In this way of thinking, the fate of the planet is linked to the fate of humans and all other species. An example of this model in action is revealed in peoples' tendency to cite 'butterfly effect' examples, in which small incidents in one locale create large effects somewhere else. This 'web of life' model is naïve and shallow—it does not help people think about *how* things are connected—but it is generally compatible with an ecosystems perspective, and when activated, opens people to explanations of how parts of ecosystems are connected and influence each other.

Works in cycles

One of the most important cultural models used to understand nature conceives nature as a set of unstoppable cycles: recurring events that repeat themselves endlessly, with inertia that is unchanging and unchangeable. Because the cycles are viewed as fixed and outside the control of humans, people thinking through this model do not perceive the need to attend to climate and ocean change. They assume that if cycles are disrupted somehow, nature has ways of re-establishing the cycles
- the earth will fix itself. This line of thinking obscures human responsibility for climate change, overestimates the ability of delicate systems to adapt to human activity, and underestimates the impact of disrupted cycles on other cycles and on humans. While cycle thinking typically makes it difficult to set up conversations about human impacts on the environment, it holds the possibility of engaging motivation to act. If the public can be persuaded that a natural cycle has been irrevocably harmed and broken, this recognition will feel deeply 'wrong' and likely be viewed as a problem that demands a solution.

Mother Nature

People can anthropomorphize the earth as a living being, comparing the planet to a mother that nurtures humans. By thinking of the earth as something akin to a deity-like figure dedicated to caring for people, they imbue the planet with both human characteristics and supernatural powers that set up unproductive ways of thinking about climate and ocean change. Mother Nature can get sick, but can heal herself, and she always ends up healthy when all is said and done. Mother Nature will never fail humans; she will always provide. Mother Nature can take care of herself; she is too powerful for mere humans to harm. Mother Nature is mysterious; her ways are too complex for humans to truly understand.

Change is natural; you shouldn't/couldn't stop it

This model holds that natural systems (ocean, earth, and atmosphere) are ever-changing, and that this change is natural; and that anything "natural" is "good." They assume, for example, that species and ice ages come and go: this is the way that nature works and always has. This way of thinking makes it easy to view claims about humans' impact on the environment with skepticism. This model also gives rise to some unease about the idea of "messing" with nature: from this perspective, human interventions in nature are seen as, well, unnatural, and therefore, likely to do more harm than good. This model holds that even if humans *could* influence changes in nature (which is viewed as highly unlikely), they probably shouldn't. While this model is fairly accurate for most of human history – before modern technology, climate affected humans, but not vice versa – in the age of fossil fuels, this cultural model presents one of the biggest cognitive roadblocks for effective translation of climate science.

POLLUTION: RELATED CULTURAL MODELS

Pollution is viewed as a problem distinct from climate change by those involved in environmental issues, but they are closely related in the public's mind. Across a decade of research, FrameWorks has observed that average citizens spontaneously raise the topic of pollution in conversations related to the environment in any way, and has further found that 'recycling' is far and away the most-frequently mentioned solution to global warming cited by average people. Pollution reasoning is dangerous if applied to climate change, since CO^2 persists in the atmosphere for centuries and can't be "cleaned up" in the manner of material pollution. Once people are engaged in this line of thinking, it is difficult to communicate about the ways in which heat-trapping gases are affecting the ocean, such as the ocean's absorption of carbon dioxide, chemical processes that lead to acidification, or the effect of increased water temperatures on various ecosystems. It's therefore quite important for climate science communicators to understand the constellation of cultural models related to pollution.

Human Caused

People easily connect oceans to man-made problems through pollution, and this can be an entry point to talking about the causes of climate change. But it is likely to go astray because material pollution and CO^2 pollution work so differently. While it is important that the public understand climate change is human caused, it isn't easy for people to make the leap from '*humans spill chemicals and drop trash*' to the more complex, and less-reversible way that the build-up of carbon dioxide is contributing to a global temperature rise.

Dirty

In the public's mind, climate change is connected to visible air pollution such as dirt and smoke. This creates an "image problem" for communicating climate change. Because many of the processes involved with climate change are invisible, people find it especially hard to conceptualize this problem, so interpreters need to take care to explain the mechanisms of climate change and its impacts. Also, if an ocean appears clean and beautiful, it's hard for the public to understand that it is damaged – and might even be 'dead' in some ways. A potentially productive aspect of this way of thinking is that people don't like dirtying things, and don't want nature to be dirtied.

The root of all problems

Peoples' thought processes about environmental problems usually start and stop at pollution because the cause and effect is so tangible and easy to understand. When people think about environmental problems, pollution is the first thing that comes to mind. This is as true for the ocean as it is for land. People can easily imagine the ocean full of c-rings, plastic bags, chemicals that people have poured down their drains, and pollutants that reach the oceans through dirty industrial practices. This leads people to conclude that pollution is the cause of all the problems in the ocean. Also, the *kinds* of pollution that people think of tend to be tangible, material things. When thinking in this mode, the public has trouble thinking of gaseous pollutants such as excess CO^2 or methane. Even if people include CO^2 combustion in their concept of pollution, they get confused about the causes of ocean acidification, temperature change, and sea level change. For example, when asked about the cause of ocean acidification, the public offers another, less common but noticeable version of the pollution model; they say that people and industries put bad things in the air, which causes the clouds to emit poisonous acid rain on the land and oceans. This acid rain makes the oceans more acidic.

Just clean it up

People are enthusiastic about cleaning up trash and pollution, but they automatically turn to mis-matched solutions, such as recycling, and other individual level solutions that don't really address the causes of climate change on a broad scale. When people think of climate change as synonymous with pollution, they are highly susceptible to policies that may solve pollution but not global warming. It focuses on retroactive mediation, not proactive prevention. People think about cleaning up discrete spills, not preventing system-wide damage. When reasoning from a pollution domain, the urgency of reducing carbon emissions as soon as possible is undermined. Addressing pollution is seen as something like picking up litter. 'Cleaning up' is a straightforward process that will quickly reverse the damage, once the clean-up action is taken. The danger here is that unlike many forms of material pollution, carbon dioxide can stay in the atmosphere for thousands of years, and can't really be removed.

Even if we do our part, other countries won't

When people think of major ocean pollutants, they often think of industrial practices. They are convinced that the oceans near newly industrialized nations are in worse shape than the oceans near richer nations, and that other countries don't follow the same environmental standards and laws as business in the US. Because of this, people reason that there is little to nothing we can do about other countries allowing corporations to pollute. This closes them down to thinking through productive solutions.