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Civilization of Oil

Reflections on a Pipeline, an Aquifer, and the Next Generation

LON APPLEBY

The decision to approve or reject the proposed Keystone XL oil and gas pipeline will surely be remembered as one of the more difficult decisions of U.S. president Barack Obama's second term. It is a measure of the stakes involved that he may continue putting the decision off, leaving to his successor the quandary of how in the twenty-first century a modern nation should meet its immediate needs, particularly for energy, when there are significant long-term costs in how these needs are met. In the age of fossil fuels, there is no more powerful fossil fuel than oil. It is simply "the principal energy source sustaining our civilization." Barely an object around us or a corner of the planet is not in some way linked to it. Oil—the accumulated dead matter from inside the planet—remains our indispensable resource, relied upon everywhere to power

our cars, trucks, ships, and planes and produce our insecticides, synthetics, lubricants, and plastics—the material, essentially, of our modern world.

The problem is, we have discovered that oil is not available in limitless amounts, and even more concerning, it is not very clean. Beginning with Rachel Carson's courageous investigation of the postwar chemical industry, which she chronicled in her landmark 1962 book *Silent Spring*, the twentieth century showed us that while we may have acquired much knowledge about the hidden powers of nature and how to harness them, we have also created new dangers that threaten not only the balance of nature but also our own well-being. In this third millennium, we have entered an era not so much of growth but of consequence.

In this essay I explore the questions that the Keystone XL pipeline raises at this turning point, with some help from my students and other students in different parts of the world, Nebraskans among them, whom I have had the pleasure of holding classes with recently.

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I teach at a progressive college that has an active interest in globalization and sustainability. At the conclusion of my classes in world history and contemporary culture, my students and I hold a “global class” with other colleges in which we take the advice of Nobel laureate Elias Canetti to “fearlessly confront the age of [our] existence” and explore the challenges of living in a world where, increasingly, many of us share the same problems and opportunities regardless of where we live.

To succeed in these globalizing times, college students today require a broader worldview, one built on an understanding of shared problems and diverse cultures of the world as a whole. The global class is a new educational model for students to develop their worldview. Classes from two or more institutions in different countries, along with their professors, meet online, face to face in real time, to explore common topics together, along with a guest who is a challenging global thinker. “Exchange and create” is the guiding philosophy. Think TED, but interactive. Students in a global class share their diverse perspectives and have the opportunity to interact with an accomplished global thinker or “citizen of the world.” Their subject is humanity and their place is the world, or as the Renaissance poet Dante wrote, “The world is my native country as the sea is to the fish.”

We have held nine global classes now, and six of them have dealt directly with oil, while one other, which looked at the democratic uprising in the Middle East, touched on it. The recurring theme of oil and energy happened not by design, but is a reflection of how vital a subject it is when exploring the forces of globalization in order to understand the workings and implications of the world’s oil-based economy. The global classes have been reveal-

ing in other ways. I have discovered there are many college students today who welcome the opportunity to look at the “big picture.” To be sure, some students have to be encouraged, but on the whole I see young people who perhaps have not been so well served by an older, compartmentalized educational system and are anxious to understand the forces of the interconnected world as they know it:

Most of the classrooms I had previously been in felt sterile, like a hospital almost. It’s always really bothered me about school. But it’s like a whole other world in there. . . . I go home feeling like I have actually really learned something. My mind is overflowing with all these abstract ideas. . . . I know I am not the only one who feels it. I have brought it up to a few other people who agree as well.

Thank you for doing this global class! It is something that should have been brought to education a long time ago. Acknowledgment and a collective mind is what sparks change. What’s that saying? “Persistent collective learning?”

This is a generation that has grown up in a globalized electronic world in which they are inundated with information. “Our children,” says British educator Ken Robinson, “are living in the most intensely stimulating period in the history of the Earth.” They are the first generation in history that takes for granted the idea of one planet and one world—the “overview effect,” as it has been described. The planet as a whole, its environment and our impact on it, and ourselves by extension are concrete and real to them, and these “globals” welcome the opportunity to explore the full scope and significance of the human experience on earth. For those of you who are

skeptical, you may soon find yourself coming to the conclusion, as I have, that it would serve us well to listen to these students.

I am Canadian, from Toronto, which is close enough to the province of Quebec to have been affected by the recent oil tanker disaster in the small town of Lac Megantic. The scale of the disaster remains, to use the only word that seems appropriate, apocalyptic. A runaway train carrying crude oil derailed and explodes, filling the sky with a rolling fireball that in seconds incinerates a town and forty-seven of its residents. There was the usual outrage; it's a familiar narrative after such disasters now. The chairman of the Montreal, Maine, and Atlantic Railway, the American company that owned the seventy-two derailed tankers, rushed to Lac Megantic. The premier of Quebec followed shortly after. Canada's prime minister, Stephen Harper, visited the scene. And then it was back to business.

As with other oil disasters of this magnitude, there seems to be a general acceptance of the damage now, as though it is the inevitable price paid for economic growth. The fact that oil spills and related accidents have been increasing around the world in the past two decades receives little more than lip service from those in a position to do more. Americans witnessed this kind of indifference during George Bush's awkward response to Hurricane Katrina. Indeed, in Canada lately, there is contempt for those who question the government's aggressive investment in oil development. Stephen Harper has made it clear he believes Canada's prosperity is tied to extracting the large reserves of oil found in the country's vast western tar sands and moving them across the Great Plains. He often speaks of Canada's opportunity to become an energy superpower. He has reversed Canada's

longstanding commitment to the environment, pulled out of international treaties, and called the tar sands development and its potential revenue for the country a "no brainer." He enjoys significant public support, despite some of the tightest restrictions on scientific research and general access to information of any prime minister in modern memory.

It's important to see the Keystone XL pipeline in this context of a turning back, it appears, to a "simpler time" when complicated modern problems could be solved with resource extraction in which minimal attention was given to environmental consequences. We know more now about our impact on the planet now. We see through the sophomoric marketing campaigns and tight restrictions on scientific research that attempt to soften the truth. Canada is not alone in avoiding the difficult questions around its reliance on a fossil fuel whose carbon emissions, as is clear from an overwhelming body of independent scientific evidence from around the world now, are directly related to the planet's changing climate. More recently, Australians elected a prime minister who had barely been in office for twenty-four hours before he turned backward by eliminating the country's carbon tax and its acceptance of immigrants.

Stephen Harper's approach to the rest of the world has been similarly small-minded. While awaiting President Obama's decision on the pipeline, he has been visiting other countries to promote the benefits of cheap Canadian oil. Selling natural resources to other countries is hardly new in Canada, which is blessed with some of the world's richest natural resources. But Harper has been especially determined to exploit Canada's oil, however complicated to extract and "dirty" it may be. In addition to the United States, he has been

aggressively courting China, whose communist government is no friend of the environment, having few controls on waste and pollution, strict restrictions on free speech and scientific research, and little interest in the rest of the world apart from any economic benefits that can be gained.

The Keystone XL pipeline has become a lightning rod for many converging interests. Both the opposition to it and the support for it have been vocal, drawing in many Canadians and Americans who live along its course that is expected to run 1,179 miles along the border of the Canadian provinces of Alberta and Saskatchewan and then on through the American states of Montana, South Dakota, and most importantly, heartland Nebraska, where it will run directly across the Ogallala Aquifer, the world's largest source of fresh water. Nebraskans are obviously concerned. The aquifer is their main source of drinking water and provides most of their irrigation water.

"Keystone is really a symbol of oil. It is very emotive," writes Daniel Yergin, the Pulitzer Prize-winning author of *The Prize: The Epic Quest for Oil, Money, and Power*. "It is probably the most famous pipeline in the history of the world, and it hasn't even been built yet."

For Nebraskans and others along the pipeline's route, Keystone XL raises important questions, to be sure, but they are questions that also transcend time and place and speak to enduring forces that have shaped the modern world for all of us. The students who have been participating in the global classes instinctively understand this. For example, here is what one student wrote after a class:

Earth is where we call home. It's the amazing blue jewel that orbits the sun. It is capable of supporting the most advanced form

of life we have come to know as Humanity, and we are its human beings. We evolved from a single-celled microorganism and it took us 3.5 billion years to get to where we are today. After we evolved, we learned how to survive off the land and soon enough came to conquer it. We kill what we please and take as we please. Scores of species have gone extinct because of us, and many more are on the verge of it. We will never be able to get them back. Mother Nature has given us warning signs, but some of us still ignore them. The biggest one of all is climate change. We keep burning oil and gas, and in the end all it is doing is polluting the air we breathe. Yes, solar and wind power may be more expensive but we have to be able to look at the long-term benefits of choosing them. Our sun is going to be here for another five billion years, so why not use its power now? We're running out of time and we need to do what's right for this earth and our future on it. Look at the Chernobyl and Fukushima nuclear accidents, for instance. If we had chosen a renewable source of energy, we wouldn't have exclusion zones and cancer rates soaring through the roof in those areas. As all these emissions and gases build up in our atmosphere, it changes the atmosphere, heats up the atmosphere, and there's nowhere for them to go. The polar ice caps start melting, causing sea levels to rise and more violent weather to strike, such as hurricanes, floods, and droughts. . . . We always seem to think Earth will be here forever, but what if that's not the case?

Another student wrote:

My mother often tells me, "You young people these days have it so easy," and I

have to agree. Technological advancements have changed the ways we communicate with each other and how we transport ourselves around where we live. Whenever she gets the chance to tell me and my sister that we are not thankful for what people her age have done for us, I always let her know I am at least. It's not wrong to proclaim that the only reason the Canadian economy has flourished in recent decades is because our predecessors worked extremely hard at forging the economy into a system that worked. It did work, but now it does not. The infrastructure that has held our economy up for some time now is now crumbling. Areas in towns and cities that we have invested so heavily in are now becoming uninhabitable because extreme weather events are ravaging low-lying areas. Some are saying we are now in a transition period. Young people across the country are calling for a shift away from traditional sources of revenue (unconventional resources) and for new investments in cleaner, less carbon intensive energy. . . . It's time to pass on the reins to the new generation, and it might happen sooner than you think. But who am I to bring up these issues? Me, I'm just one of the rank and file in this generational shift. There are a lot of young people right now across the country with great ideas that are really frustrated with the direction Canada is moving in. The transition can only be accomplished if the right individuals take action on specific issues that are threatening the survival of our descendants. Low lying coastal areas are being engulfed by water as sea levels rise, floods are ravaging provincial capitals and decimating towns downstream. Major weather events will only increase in fre-

quency unless we stop relying on the carbon intensive products that we have relied on for decades. Although our progress here at home can seem miniscule on a global scale, that's not important. Canada needs to start setting an example internationally about how we feel about our natural environment, and the type of economy we are going to be passing on to our descendants.

There are other assignments I can cite—journals, research papers, videos, presentations—in which students recognize that there are bigger issues at stake than how much better off they could be if their country were exploiting deeper reserves of oil. Given the very modern choice between short-term economic gain and long-term environmental impact that our dependence on oil presents, they understand it is a choice that carries increasing consequence.

The Keystone XL pipeline should not be confused with the other pipeline called Keystone that presently runs from Alberta across the Canada-U.S. border down through North Dakota, South Dakota, Nebraska, and Illinois. That pipeline is important in this saga too, with the capacity to carry nearly six hundred thousand barrels per day of crude oil to refining markets in the American Midwest. The XL pipeline, which is also a TransCanada initiative, will be an extension of this system, which itself is part of a vast energy transportation network that stretches across the planet. In the United States, for instance, over three thousand companies operate more than 2.5 million miles of pipelines. To comprehend the scale, imagine one pipeline going around the planet one hundred times. America, like all modern nations, is held together with its oil-delivery grid and essentially rises and falls on its power.

Fig. 1. The proposed route of the Keystone XL pipeline. Source: Created with QuantumGIS, Natural Earth Data.

As the director of one national business organization in Canada recently wrote:

The notion of Canada without a robust pipeline infrastructure is akin to a human body without arteries or a village without roads. It is simply not possible. Pipelines—and more importantly the oil and gas that they transport—are so vital to the functioning of the Canadian and global economy that it is essential that we have the means to distribute these resources throughout our country and to an energy-hungry world.

The director presents figures such as an estimated one million jobs that he says will result from the pipeline's construction over the next twenty years. To be sure, numbers count. But they can also vary, as was made clear with the figures that President Obama recently cited when describing the economic benefits that Keystone XL will bring Americans. Those who

support the pipeline tend to cite figures that show significant job growth, and those who question it tend to cite lower figures. What we can say with certainty is that the oil extracted from Alberta's dense and saturated loose tar sands is heavier and more corrosive than conventional crude oil and can do more damage to the land if there's a spill. Oil extracted and processed from sand is more carbon intensive than the equivalent amount of oil from Saudi Arabia or Texas. Tar sands oil is not the oil of the past. Over the last two hundred years, conventional sources of oil have been exhausted by human consumption. This newer, heavier oil, called "bitumen," is more difficult to extract, some likening it to the process to tapping for a deeper vein.

To see the process is to visit an otherworldly place. The Alberta Tar Sands is the largest industrial development on earth. One student wrote:

The area under development . . . is equivalent to the size of Florida and England. Coming from New Brunswick, I have several family members that have gone to Alberta for work and to make "the big bucks." They say it is an entirely different world out there. I have seen the pictures of the machines and trucks that are three stories high and it is almost unbelievable the size of them and the size of the whole project! One thing about the oil sands that upsets me is that because of how they have to extract the oil from the sand, they have to cover so much ground. It's a sprawling operation. This destroys any natural habitat that was previously there. They just rip up the land, take what they want, and move on, leaving a mess behind. It looks like an oil spill on land!

TransCanada has been running an aggressive marketing campaign to show that its pipeline systems are sophisticated and safe, conforming to the highest possible design standards:

Only top-quality steel and welding techniques are used. Extra precautions are taken at road, railway and river crossings or near denser population areas. X-rays or ultrasonic processes are used to check welds during construction, and pipes are pressure tested afterwards to identify any defects. Coatings are used to protect against corrosion. These state-of-the-art precautions are why 99.9994 per cent of liquid product was transported safely by pipelines between 2002 and 2011.

The company has made an attempt to deal with the concerns about the impact the XL pipeline could have on the Ogallala Aquifer by agreeing to change its route in one stretch, but as a corporation whose survival is based on the extraction of fossil fuels, it still must answer to the broader legacy from the twentieth century that has continued into the twenty-first of an oil-based economy that puts economic gain ahead of environmental impact. Consider this. Since 2011, the United States has experienced twenty-five extreme weather events that each caused more than \$1 billion in damages. These events contributed to the loss of more than one thousand lives and each American household having to pay \$400 more per year. Climate change leads to extreme weather like this. Carbon emissions from the burning of fossil fuels leads to climate change. It is not difficult to see where the problem begins.

At my college, increasing numbers of students are taking new courses in renewable energy,

environmental technology, water quality, and science. Some had worked previously in older industries before they decided to return to college; many others are teenagers. What they have in common is an understanding that we are in a new millennium. The challenges we face collectively as a growing global civilization extend beyond our cities and countries and borders and take in all the planet now. The wreckage from a nuclear accident in Japan washes up on the shores of Canada. The carbon emissions that turn the skies gray over the metropolises of China are not somehow walled off from the skies over the Arctic. This is what we have learned. Humanity's presence on planet earth is becoming a powerful thing, and it is a truth we must all face.

That is another thing I have learned standing in front of young people day after day who have been in school long enough to be considered professional students by now. What inspires them most is the truth. They apparently abide by the adage "the richest legacy of all is honesty." What they want is to clear away the hype, ideology, and propaganda, and to hear the best, most up-to-date facts that human knowledge can provide. When that happens, students listen. Since the beginning of civilization a mere ten thousand years ago in the span of life on earth, human beings with their quest for knowledge and a deeper understanding of our purpose on earth have been developing a larger and larger perspective. Our horizon has been expanding. We have seen that we are one among the stars and that it is the sun and the water around us, not us, that ultimately keeps us here. We have learned much from our scientists, our explorers, our investigators of truth. Edward O. Wilson puts it this way:

Modern humanity was born, so speak, about ten thousand years ago with the in-

vention of agriculture and the villages and political hierarchies that soon followed. Up to that point our species had perfected hunter technology enough to wipe out a large part of Earth's largest mammals and birds—the Megafauna—but it left most of the vegetated land surface and all of the oceans intact. The economic history that followed can be summarized very succinctly as follows: people used every means they could devise to convert the resources of Earth into wealth.

Oil is arguably the most powerful resource we have ever extracted from the planet. And it is possible, as we slowly but surely exhaust nature's finite supply of it, that we will continue to find ever deeper and more sophisticated ways of getting it out of the planet. But there is a hard truth we will all have to accept sooner or later, as more of the world begins to consume at the levels of countries like Canada and the United States, about its limited supply and more immediately about the ever-increasing amount of its contaminating byproducts that we put into the atmosphere.

I can give no better example of how young people today understand what lies ahead for them than one of the global classes we recently held with students at the University of Nebraska–Lincoln. Professor Charles Braithwaite has also created a global classroom, in which his students regularly hold online classes with students from Turkey, Russia, Spain, Costa Rica, Pakistan, and now with Canada. The theme of our global class with the Nebraska students was the environmental cost of constructing the Keystone XL pipeline across the Ogallala Aquifer, one of the world's great natural resources. Our guest was the young son of an oil executive who spoke movingly

of visiting the sprawling refinery in India that his father managed, seeing its cost on the local community around it, and returning to Canada where he began to fight against attempts to build a pipeline from the tar sands through indigenous communities in western Canada to ports on the Pacific coast. The students listened closely. Those who said they had to leave early ended up staying for the entire class. They were particularly interested in how the guest's father had reacted to his son's campaign. As it turns out, the father has been learning from his son.

After the class, one student took what he learned and posted this bold declaration on the class blog:

Because of our current dependence on the oil industry, and because there is currently no alternative energy infrastructure capable of sustaining the energy demands of our growing society, I have in all my authority graciously allowed the Governments of Canada and the United States of America to proceed with plans to build oil pipelines through our countries, so long as the following non-negotiable conditions are met in full:

1. Current infrastructure and industry innovation must be focused towards building and maintaining better and safer pipelines within the next three years. Number of oil spills must be brought down from 300 per year to zero, period.
2. First Nations lands, privately owned farmlands, lands in close proximity to urban locations, and delicate natural environments (such as aquifers) will be avoided if reasonably possible. If the Government finds it to be unreasonable

Fig. 2. Global classroom connection between University of Nebraska–Lincoln and Durham College. April 2, 2012, University of Nebraska–Lincoln.

to avoid these locations, quality assurance and preventive measures to avoid contamination will be given top priority to these areas of at-risk natural resources and at-risk communities.

3. Year-round management of pipelines in areas of at-risk natural resources and at-risk communities will be sustained by the owners of the pipeline and regulation standards will be set by representatives of a party independent of Government and Oil industry who will be serving the best interest of local populations and land.
4. Lobbying towards this independent pan-

el on part of oil producing/manufacturing corporations is strictly prohibited. Acceptance of monies or any other gifts from oil producing/manufacturing corporations to gain privileges or favours within the panel is strictly prohibited.

5. A significant portion of recaptured income of oil producing/manufacturing corporations will be invested into alternative energy research and development. Any patents or infrastructure developments made on the part of oil corporations towards alternative energy will be rewarded with tax credits and additional financing on part of the Gov-

ernment to encourage more sustainable long-term jobs in the energy industry.

6. Education and job training for any potential career in alternative energy industry created by oil corporations will be provided to persons currently working in the oil producing and manufacturing industry on behalf of the oil corporations (e.g., full scholarships) to transition workers from one industry to another.
7. Gas prices will no longer be coincidentally raised to ridiculous prices when there just happens to be a long weekend.

Perhaps the most compelling assignment after the class was a twenty-minute video a student produced, titled "Resonating Questions," in which he explored the challenges our interconnected world is facing in environment, energy, population, and poverty. Below are some of the questions he posed.

Is it simply our destiny to consume all of the resources on the planet?

At what point would it be obvious that the environment is in a state of crisis?

Assuming the vast majority of experts are correct that global warming is real and here, how could we solve this issue?

Is recycling your paper and plastic going to be enough of a contribution to change our course?

With carbon pollution, deforestation, and the potential collapse of the food web, how

much time could we have before recovery is impossible?

What if we change our ways and it turns out we were wrong about climate change?

What if we don't change our ways and it turns out we were right?

Are you prepared for an energy crisis?

How do you prepare for an energy crisis?

How long will it be before we hit "peak oil" and oil is too expensive to extract and refine?

What will a world without cheap oil look like?

Or should we put limits on human development and consumption to spare the natural world?

It is abundantly clear that humanity is exploiting the earth's resources to such an extent that nature itself is being altered, perhaps irreversibly. This is the age of our existence. We have become a species that uses our remarkable discoveries and inventions, through the power of human science and engineering and technology, to transform nature's power into ours. We have entered what might be called a postnatural world that is largely shaped by science in ways we have only begun to understand. The achievements of human technology are great and the curiosity and pursuit of knowledge behind them cannot or should never be curtailed. But we must listen to what the next generation is telling us about the consequences of our actions if the world that emerges from these achievements is to be a better one.