



# Policy Briefing Paper

*KAIROS Policy Briefing Papers are written to help inform public debate on key domestic and foreign policy issues*

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## IPCC Confirms We Must Act Now on Climate Change

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With the release of its Fifth Assessment Report, the Intergovernmental Panel on Climate Change (IPCC) confirms that humans are indeed responsible for global warming unprecedented over the past 800,000 years. Global temperatures have already risen by 0.85 degrees Celsius since 1880. They will surpass 2°C, the target endorsed by many countries including Canada, by 2100 unless much more vigorous actions are taken to reduce greenhouse gas (GHG) emissions.

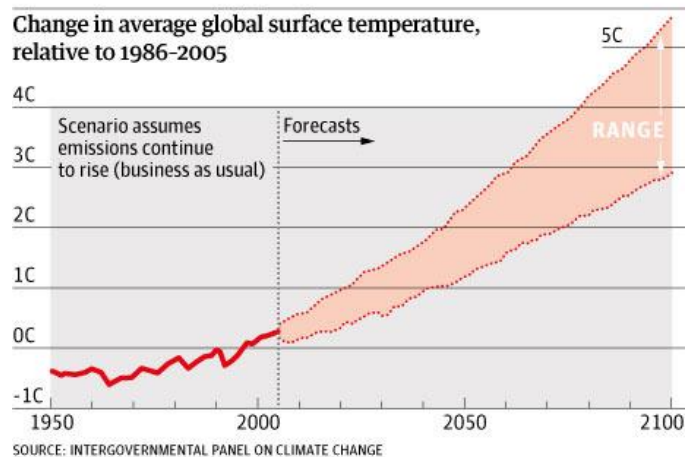
It projects that average surface temperatures are likely to be 2.6°C to 4.8°C above 1986-2005 levels by 2081-2100.<sup>1</sup> The panel's co-chairs say temperature increases could exceed the upper range of this projection within the lifetimes of children alive today.

The report says that human-induced climate change caused by carbon dioxide (CO<sub>2</sub>) emissions is largely irreversible over many centuries as "15% to 40% of emitted CO<sub>2</sub> will remain in the atmosphere longer than 1,000 years."<sup>2</sup> Warming will continue for generations even if we stopped all emissions today.

This IPCC report is a cautious assessment in many respects as its Summary for Policymakers, drafted by a committee of 259 climate scientists, was negotiated line by line with representatives from 110 governments. Nevertheless it contains many important findings that we ignore at our peril:

- "Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. In the Northern Hemisphere, 1983-2012 was likely the warmest 30-year period of the last 1400 years."<sup>3</sup>

### How hot will it get?



- Sea levels rose faster after 1850 than over the previous 2,000 years due mostly to thermal expansion of warmer oceans and melting of glaciers. They could rise by nearly one metre by 2100. This would inundate several small island states and put 40 million people living in large coastal cities at risk.<sup>4</sup>
- Over the last two decades the Greenland and Antarctic ice sheets have been losing mass at an accelerated pace. When high-latitude temperatures were two degrees warmer than at present thousands of years ago, the melting of the Greenland ice sheet contributed between 1.4 and 4.3 metres to higher sea levels.<sup>5</sup>

- Since 1979 the extent of Arctic Sea ice has declined by between 3.5% and 4.1% per decade. Climate models predict ice-free summers in the Arctic ocean as soon as 2050.
- The frequency and intensity of storms will likely increase, especially over mid-latitudes and tropical regions, particularly affecting low-income populations in Asia and Africa.
- More severe droughts are expected around the Mediterranean Sea and in West Africa.

### IPCC Reinforces Findings of Other Studies

The IPCC report reinforces what other investigations have concluded. A report commissioned by Price Waterhouse Coopers entitled *Too Late for two degrees?* found that “Governments’ ambition to limit warming to 2<sup>0</sup> C appear highly unrealistic.... Even doubling our current rate of decarbonisation, would still lead to emissions consistent with 6 degrees of warming by the end of the century. To give ourselves a more than 50% chance of avoiding 2 degrees will require a six-fold improvement in our rate of decarbonisation.”<sup>6</sup>

Likewise in June of 2013 the World Bank released *Turn Down the Heat* which affirms that “in absence of further mitigation action there is a 40% chance of warming exceeding 4<sup>0</sup>C by 2100 and a 10% chance of it exceeding 5<sup>0</sup>C in the same period.”<sup>7</sup> The World Bank goes on to spell out some of the consequences - declines of water availability of 40% are projected under 2<sup>0</sup>C warming and a 50% decline for some regions under 4<sup>0</sup>C warming. Ominously the Bank says “It will be impossible to lift the poorest on the planet out of poverty if climate change proceeds unchecked. Strong and decisive action must be taken to avoid a 4<sup>0</sup>C world – one that is unimaginable and laden with unprecedented heat waves and increased human suffering.”<sup>8</sup>

### IPCC’s Refutes Climate Sceptics

The IPCC Summary for Policymakers contains specific information that refutes the claims cited by climate change deniers. A frequent claim put forward these days by climate change sceptics is, in the words of *Globe and Mail* columnist Margaret Wente, that “The world stopped warming up.”<sup>9</sup> In fact what the data shows is that the **rate** at which the planet is warming slowed down over the years 1998-2012 while the warming trend continued over those years.

The IPCC report states that “Due to natural variability, trends based on short records are very sensitive

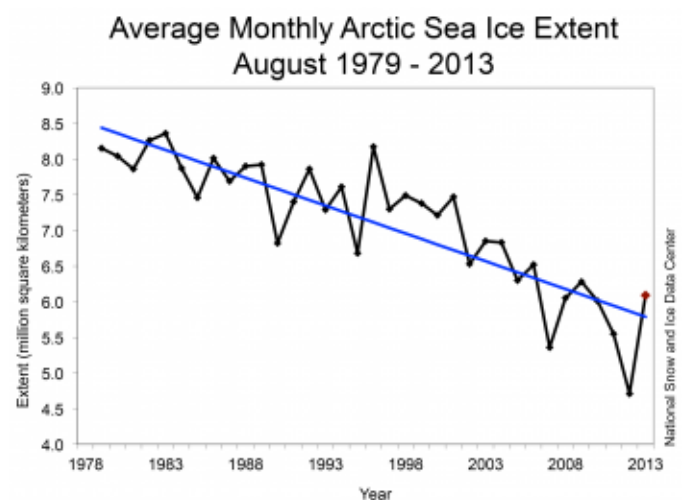
to the beginning and end dates and do not in general reflect long-term climate trends.”<sup>10</sup> The beginning of the 1998-2012 period corresponds to a strong El Niño effect that brought warmer waters to the eastern Pacific Ocean.

The IPCC offers several plausible explanations for a slowing rate of warming after 1998. Over the years 2008-2011 volcanic eruptions spewed more aerosol particles into the atmosphere dampening the greenhouse effect by reflecting more sunlight back into space. There was a downward phase in the 11-year cycle of solar activity. There has also been a transfer of heat from the upper level of the world’s oceans into deeper waters.<sup>11</sup>

### Arctic Ice Shrinking

Another favourite theme of climate sceptics is to point out that loss of sea ice in the Arctic this year was less than in 2012. While this is true no credible conclusion can be drawn from just a one year change. In fact, the extent of Arctic sea ice in the summer has declined by between 9.4% and 13.6% each decade since 1979.<sup>12</sup> This summer’s ice cover was the sixth-lowest on record.

The graph below shows the downward trend in the extent of summer ice in the Arctic since 1979. Jennifer Francis, a research at Rutgers University explains “Last year was so outrageously low that it was really no surprise that it would not be quite so low this year.”<sup>13</sup> Since 1980, the Arctic has lost 40% of its ice cover and 75% of its volume. This thinning makes the ice more vulnerable to melting and so the downward trend is likely to continue until the Arctic is ice free in the summer only a few decades from now.



### Weakness in the IPCC approach

One of the weaknesses of the IPCC approach is that it only focuses on some kinds of feedback mechanisms. These are changes in atmospheric, land or ocean conditions that themselves accelerate climate change. A study in the *Quarterly Journal of the Royal Meteorological Society* notes how the IPCC focuses on “fast feedbacks” like water vapour, natural aerosols, clouds and snow cover without sufficiently accounting for “slower feedbacks.”<sup>14</sup>

These slower feedbacks include the albedo effect whereby less sunlight is reflected back into space and more heat is absorbed after ice sheets melt exposing darker surfaces. Changes in natural carbon sinks both on land and in the oceans can also lead to slow feedback effects. As oceans absorb more CO<sub>2</sub> and heat their absorptive ability decreases. They could reach a saturation point and eventually become a source of CO<sub>2</sub> emissions rather than a sink.

Estimates of warming based only on fast feedbacks lead to projections that a doubling of CO<sub>2</sub> in the atmosphere would result in a rise in global temperatures of about 3°C above pre-industrial levels. However, a study by a team based at the Earth Institute at Columbia University, taking into account slow feedbacks from the melting of ice sheets, finds that a doubling of CO<sub>2</sub> emissions would lead to temperature increase between 6°C and 8°C.<sup>15</sup> Another study by scientists at the Lawrence Berkeley National Laboratory and the University of California found that the IPCC’s estimates of worst case scenarios are too low. When reinforcing feedback loops are taken into account, those scientists conclude that global average temperatures could rise by as much as 8°C by the end of this century.<sup>16</sup>

### Burning a Third of Remaining Fossil Fuels Would Make the Earth Uninhabitable

Studying the consequences of these slower feedback loops is a central theme of the work of renowned climate scientist James Hansen, as described in earlier KAIROS Briefing Papers.<sup>17</sup> Hansen and colleagues from the Earth Institute at Columbia University and the NASA Goddard Institute for Space Studies have just published a new study on *Climate Sensitivity, sea level and atmospheric carbon dioxide* warning that continuing to burn fossil fuels at the same rate as at present will render most of our planet uninhabitable.<sup>18</sup>

The study finds that a doubling of CO<sub>2</sub> levels from preindustrial levels is likely to lead to temperature increases higher than the three to four degrees Celsius predicted by others. Moreover the authors

show that we are headed well past a doubling of CO<sub>2</sub> levels towards a tripling or even a quadrupling of atmospheric carbon dioxide. They say that if we were to burn all available fossil fuels, atmospheric CO<sub>2</sub> would increase by a factor of about 4.8 times its pre-industrial level. Hansen and colleagues conclusion is ominous:

Burning all fossil fuels would produce a different, practically uninhabitable, planet.... Our calculated global warming in this case is 16°C, with warming at the poles approximately 30°C. Calculated warming over land areas averages approximately 20°C. Such temperatures would eliminate grain production in almost all agricultural regions in the world.... Global warming of that magnitude would make most of the planet uninhabitable by humans.<sup>19</sup>

How much of known fossil fuels can we then afford to burn without pushing the climate over a tipping point on a road to no return? Hansen and colleagues note that total fossil fuel reserves and resources contain approximately 15,000 gigatonnes of carbon (Gt C). (A gigatonne is one billion metric tonnes.) Most of this fossil carbon is found in coal and in unconventional fuels such as tar sands and shale oil and shale gas that can only be recovered through hydraulic fracturing. Burning as little as one third of this total, containing 5,000 Gt C, might be enough to yield a temperature increase beyond the level tolerable by humans. Yet, “If we assume that fossil fuel emissions increase by 3% per year, typical of the past decade and of the entire period since 1950, cumulative fossil fuel emissions will reach 10,000 Gt C in 118 years.”<sup>20</sup> Hence we must decrease consumption of fossil fuels dramatically if we are to stop runaway climate change. Hansen and colleagues conclude:

Humanity stands at a fork in the road. As conventional oil and gas are depleted, will we move to carbon-free energy and efficiency—or to unconventional fossil fuels and coal? If fossil fuels [producers] were made to pay their costs to society, costs of pollution and climate change, carbon-free alternatives might supplant fossil fuels over a period of decades. However, if governments force the public to bear the external costs and even subsidize fossil fuels, carbon emissions are likely to continue to grow, with deleterious consequences for young people and future generations.... Whether governments continue to be so foolhardy as to allow or encourage development of all fossil fuels may determine the fate of humanity.<sup>21</sup>

## IPCC Includes a Carbon Budget

Although the IPCC avoids the dramatic language of Hansen and colleagues, it does for the first time contain data on how much fossil fuel we can afford to burn before pushing the climate beyond two degrees. It estimates that if we are to have a 66% chance of keeping the rise in global temperatures at less than 2°C, then total CO<sub>2</sub> emissions from the period 1861-1880 forward must contain no more than one trillion tonnes of carbon (or 1,000 Gt C).

After accounting for warming factors other than CO<sub>2</sub> emissions, the IPCC indicates that the upper limit for carbon emissions from burning fossil fuels is 800 Gt C. Then it notes that 531 Gt C have already been emitted since 1880, leaving a carbon budget of just 269 Gt C that could be emitted without tipping temperatures above the 2°C threshold.<sup>22</sup> A table in the report shows that the world is on track to emit 1,685 Gt C between 2012 and 2100 or over 6 times the permissible limit. At current rates of carbon emissions of between 10 and 11 Gt per year, in only 26 years we risk exhausting this carbon budget unless we make significant cuts to our use of fossil fuels.

Significantly, extracting and burning all the bitumen in place in the Alberta tar sands would result in 238 Gt of carbon emissions, that is 88% the 269 Gt C limit. If only the 170 billion barrels of tar sands crude deemed recoverable with current technologies were burned, the 22 Gt of carbon released would still amount to 8% of the world's allowable emissions.<sup>23</sup>

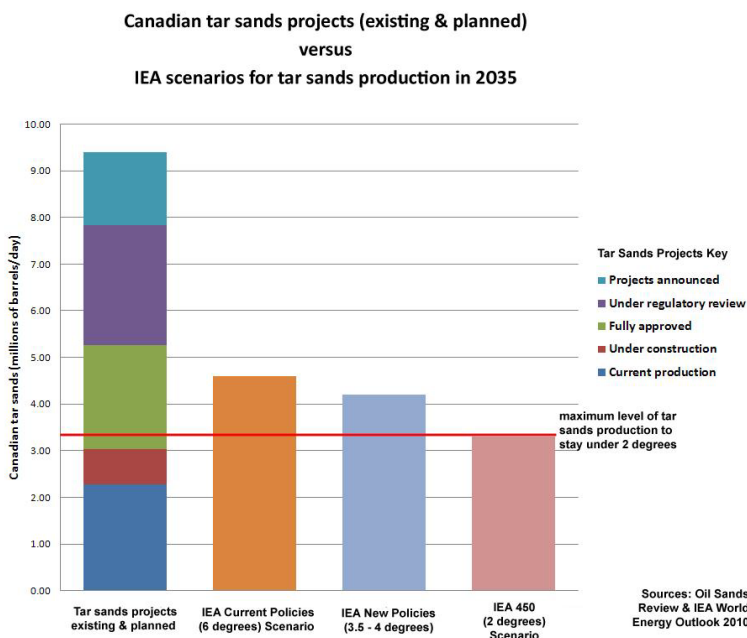
## International Energy Agency: Two-Thirds of Fossil Fuels Must Stay in the Ground

The International Energy Agency (IEA), a body set up to ensure oil supplies for industrial nations in the wake of the 1973 oil embargo by members of the Organization of Petroleum Exporting Countries, is an unlikely candidate for an advocate of reducing fossil fuel use. Nevertheless, the IEA makes a strong case, similar to that contained in the Hansen and IPCC reports, for leaving fossil fuels in the ground.

The IEA's 2013 report, *Redrawing the Energy-Climate Map*, concludes that "Policies that have been implemented, or are now being pursued, suggest that the long-term average temperature increase is likely to be between 3.6°C and 5.3°C, with most of the increase occurring this century."<sup>24</sup>

In the 2012 edition of its annual *World Energy Outlook*, the IEA concludes that "No more than one-third of proven reserves of fossil fuels can be consumed prior to 2050 if the world is to achieve the 2°C goal."<sup>25</sup> Furthermore the IEA calculates that if we are to have a 50% chance of keeping temperature rises below two degrees then production from the Alberta tar sands must be no larger than 3.3 million barrels a day (mb/d) by 2035.

The 3.3 mb/d limit is the same as that advocated in KAIROS' 2010 policy paper *Drawing a Line in the Sand: Why Canada needs to limit tar sands expansion and invest in a green economy*. In that paper we called for "No further approvals for tar sands projects."<sup>26</sup> At the time tar sands operations in production, under construction or approved had a total capacity of 3.3 mb/d. As the figure below shows, since 2010 several more tar sands projects have been approved. If all these are built, production would exceed 4.6 mb/d, the level that the IEA says would be consistent with six degrees of warming. Hence the challenge now is not just to deny new approvals but also to roll back projects approved after 2010.



## Canadian Leadership?

On the day the IPCC report was released Environment Minister Leona Aglukkaq issued a statement claiming that the federal government is already “playing a leadership role in addressing climate change.” This statement was soon withdrawn from the department’s web site as it met with ridicule from many quarters. In fact by Environment Canada’s own reckoning, Canada is on track to meet only half of the emission reductions promised after the 2009 Copenhagen climate conference. Even if Canada were to meet its goal of reducing emissions to 17% below their 2005 levels by 2020, and other signatories to the Copenhagen accord were to meet their goals, the world would still be on track for temperature increases well above 2°C.<sup>27</sup>

The tar sands are the fastest growing component of Canadian GHG emissions. The carbon footprint from the extraction and upgrading of bitumen into synthetic fuel is 3.2 to 4.5 times larger than that of conventional oil extraction.<sup>28</sup> As Mark Jaccard, a professor of environmental economics at Simon Fraser University and member of the National Roundtable on the Environment and Economy until it was dismantled by the federal government states, “Canadian politicians are simply not telling the truth. You can’t keep expanding the tar sands and meet the reduction target.”<sup>29</sup>

Yet on the very eve of the release of the IPCC report, Prime Minister Stephen Harper continued to declare that the arguments in favour of building the Keystone XL tar sands export pipeline were “overwhelming.”<sup>30</sup> Several export pipelines are vying for approval: the Keystone XL South to the Gulf of Mexico, the Northern Gateway and Kinder Morgan lines west to the Pacific, and the Energy East and a plan to reverse Enbridge’s Line 9 to take bitumen to Atlantic ports. Building any of these projects would, in the words of James Hansen, “open the spigot” to more tar sands production. The current pipeline capacity is sufficient to move 3.8 md/d of bitumen or more than the 3.3 mb/d capacity limit discussed above.<sup>31</sup>

As President Obama weighs the pros and cons of whether to approve the Keystone XL<sup>32</sup>, the IPCC report just might help tip the balance. Secretary of State John Kerry, whose department has yet to deliver a final recommendation on the pipeline to the president, called the IPCC report an “alarm bell,” adding that “the costs of inaction are beyond anything that anyone with conscience or common sense should be willing to even contemplate.”<sup>33</sup>

Civil society organizations, particularly 350.org, continue to put pressure on the White House to deny approval for the Keystone XL.<sup>34</sup> A denial of a permit for that project would be an important victory but hardly enough to stop the expansion of the tar sands. Hence a wider coalition of civil society and Indigenous peoples’ organizations from Canada, the U.S. and Europe have banded together in the Tar Sands Solutions Network to stop the “the expansion of the Canadian tar sands and its infrastructure of pipelines and tankers.”<sup>35</sup>

## Green Alternatives

While halting the expansion of tar sands projects is an urgent task, building viable, clean energy alternatives is equally important. KAIROS is a member of the Green Economy Network (GEN) along with several trade unions, civic and environmental groups. GEN will soon launch campaigns for policy initiatives for retrofitting buildings, expanding public transportation and producing renewable energy that have substantial potential for reducing our dependence on fossil fuels. The GEN plan of action envisions creating the equivalent of over four million new full-time jobs for one year each (person job years) while reducing Canada’s GHG emissions by over 100 million tonnes a year by 2020.<sup>36</sup>

The Green Economy Network’s plan envisions:

- An annual investment of \$4.65 billion in wind, solar and geothermal power production to create 92,000 full-time person job years.
- A \$50 billion investment over 10 years in building retrofits for energy conservation, creating around 988,800 person job years while reducing GHG emissions by 10 million tonnes annually by 2020.
- An investment of \$55 billion over 5 years in public transportation to create annually 211,599 person job years. One-third of this amount will require new funding from provincial and federal governments.
- Dedicating \$5.14 billion a year for five years to the construction of high speed rail links between major cities would create another 101,647 person job years.

## Conclusion

While the prime minister touts the job-creating potential of investing in the tar sands, the reality is that six to eight times as many jobs would be created by investing in conservation and renewable energy programs.<sup>37</sup> Moreover, redirecting subsidies away from fossil fuels, collecting adequate royalties on their ex-



traction and taxing activities that emit GHGs would fight climate change and finance green alternatives all at the same time.<sup>38</sup> To those who say we cannot afford to battle climate change we must reply that we cannot afford not to. Sustaining life on Earth depends on it.

<sup>1</sup> Intergovernmental Panel on Climate Change. *Summary for Policy-makers of Working Group One Contribution to the IPCC Fifth Assessment Report: Climate Change 2013: The Physical Science Basis*. Stockholm. September 27, 2013. P.15.

<sup>2</sup> Ibid. p. 20.

<sup>3</sup> IPCC. op. cit. p.3.

<sup>4</sup> See Tim Folger. "Rising Seas." *National Geographic*. September 2013. P.30-59 for a dramatic description of the consequences or higher sea levels.

<sup>5</sup> IPCC. op. cit. p.7.

<sup>6</sup> PricewaterhouseCoopers. *Too late for two degrees?* London: V. November, 2012. P.3.

<sup>7</sup> World Bank. *Turn Down the Heat*. Washington: World Bank. June 2013. Executive Summary p.1.

<sup>8</sup> Ibid. P.11.

<sup>9</sup> Margaret Went. "Climate's big PR problem." *The Globe and Mail*. September 24, 2013. A15.

<sup>10</sup> IPCC. op. cit. p.3.

<sup>11</sup> Ibid. p.10.

<sup>12</sup> Ibid. p.6.

<sup>13</sup> Cited in Suzanne Goldenberg. "Arctic on course for ice-free summer 'within decades', scientists say." *The Guardian*. September 20, 2013.

<sup>14</sup> Nafeez Ahmed. "Climate change to have double impact – study." *The Guardian*, September 18, 2013.

<sup>15</sup> Ibid.

<sup>16</sup> Ibid.

<sup>17</sup> See KAIROS Briefing Paper No. 29. *Arctic Melting Sounds the Alarm for Life on Earth*. December 2011 at <http://www.kairoscanada.org/wp-content/uploads/2011/12/PBP29-ArcticIce.pdf> and Briefing Paper No. 26. *Decisive Action Vital at Cancun Climate Talks*. November 2010. at <http://www.kairoscanada.org/wp-content/uploads/2011/09/PBP26-Cancun.pdf>

<sup>18</sup> Hansen J, Sato M, Russell G, Kharecha P. *Climate sensitivity, sea level and atmospheric carbon dioxide*. Philosophical Transactions of the Royal Society. September. 2013. at <http://www.kairoscanada.org/wp-content/uploads/2011/12/PBP29-ArcticIce.pdf> <http://rsta.royalsocietypublishing.org/content/371/2001/20120294.full.pdf+html>

<sup>19</sup> Ibid. P.24.

<sup>20</sup> Ibid. P.25.

<sup>21</sup> Ibid. P.25.

<sup>22</sup> Calculated from data in IPCC op. cit. p.20.

<sup>23</sup> The data used here are from Neil C. Swart and Andrew J. Weaver. "The Alberta oil sands and climate." *Nature Climate Change*. 19 February 2012. Note that the data cited here are for gigatonnes of carbon and not directly comparable to the widely cited data for gigatonnes of carbon dioxide from 350.org founder Bill McKibben's widely cited article "Global Warming's New Math" from *Rolling Stone*, August 2012. McKibben reports that to have an 80% chance of keeping the rise in global temperatures below 2°C the world can only release 565 Gt of carbon dioxide by 2050. Translating McKibben's data for CO<sub>2</sub> into carbon yields a carbon budget of just 154 gigatonnes of carbon or just over half as much as the limit estimated by the IPCC.

<sup>24</sup> International Energy Agency. *Redrawing the Energy-Climate Map*. Executive Summary. Paris: International Energy Agency. June 2013. P.9.

<sup>25</sup> International Energy Agency. *World Energy Outlook 2012*. Executive Summary. Paris: International Energy Agency. November 2012 p.3.

<sup>26</sup> KAIROS position paper. *Drawing a Line in the Sand*. July 2010. at <http://www.kairoscanada.org/wp-content/uploads/2010/12/Sust-Tar-DrawingLine.pdf>

<sup>27</sup> See KAIROS Briefing Paper No. 28, *Is Durban the world's last, best hope to avoid climate disaster?*. October 2011 at <http://www.kairoscanada.org/wp-content/uploads/2011/10/PBP28-Durban.pdf>

<sup>28</sup> Michelle Meech, *A Comprehensive Guide to the Alberta Oil Sands*, May 2011. P.6.

<sup>29</sup> Cited in Stephen Leahy. *A Stark Choice: Extreme Heat or Dirty Fuels* IPS Aug. 27 2013

<sup>30</sup> Cited in Joanna Slater, "Harper stands firm on Keystone." *The Globe and Mail*. September 27, 2013. A1.

<sup>31</sup> See Michelle Meech, op. cit. p.47.

<sup>32</sup> See *Will Obama's Climate Speech be a Game Changer?* At <http://www.kairoscanada.org/sustainability/will-obamas-climate-speech-be-a-game-changer/>

<sup>33</sup> Cited in Bruce Cheadle. "Canada A Leader on Climate Change, But 'Carbon Tax' Will Kill Jobs: Tories." *Huffington Post*. September 27, 2013.

<sup>34</sup> See 350.org web page *This is how we Draw the Line on Keystone XL*. at <http://350.org/about/blogs/how-we-draw-line-keystone-xl>

<sup>35</sup> See Tar Sands Solutions Network at <http://tarsandsolutions.org/about/>

<sup>36</sup> See Green Economy Network, *Making the Shift to a Green Economy*, Ottawa: Green Economy Network at [http://polarisinstitute.org/files/GEN-Common-Platform-EN\\_web.pdf](http://polarisinstitute.org/files/GEN-Common-Platform-EN_web.pdf)

<sup>37</sup> Blue Green Canada. *More Bang for Our Buck: How Canada Can Create More Energy Jobs and Less Pollution*. Toronto: Blue Green Canada. November 2012. P.1.

<sup>38</sup> For a discussion of how to finance a transition from fossil fuels see John Dillon. *A Sustainable Energy Economy is Possible*. KAIROS Research Paper. May 28, 2012. Pages 25-28. At <http://www.kairoscanada.org/wp-content/uploads/2012/06/SUS-Research-SustainableEnergyEconomyPossible.pdf>

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