

From: [Philip Bogdonoff](#)
To: county.council@montgomerycountymd.gov
Subject: Written testimony regarding Thrive Montgomery 2050 from Philip Bogdonoff
Date: Friday, July 9, 2021 5:14:56 PM
Attachments: [2021-06-29 Slides for Thrive testimony.pptx](#)
[Climate Refugees + Migrants Memo for the draft Climate Action Plan - from P. Bogdonoff.docx](#)

Council members:

I gave oral testimony on June 29, 2021 regarding the Thrive 2050 plan. Two minutes is a very brief period of time in which to convey a range of important ideas that will shape the coming decades. I offer the attached annotated slides to supplement the oral testimony I gave on June 29. I acknowledge the considerable work that has been put into the formulation of the Thrive 2050 plan. However, I believe the vision encompassed in that plan significantly overlooks trends that will likely come to dominate our life in even the coming decade.

In addition, I attach a memo regarding the issue of climate migrants that I previously prepared for the Climate Action Plan. I do not detect significant attention to this growing issue in the Thrive plan, either.

I fervently desire that these contributions will be useful.

Best regards,

-- Philip

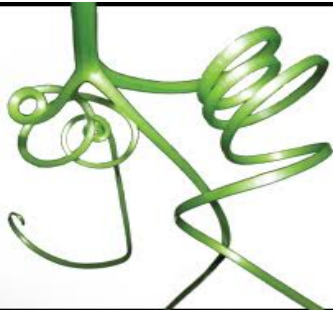
Philip Bogdonoff

Our Energy Predicament

Comments to Montgomery County Council
related to Thrive 2050

by Philip Bogdonoff

June 29, 2021



Biodiversity for a Livable Climate

Restoring Ecosystems to Reverse Global Warming

Overview of points:

1. Our society's systems and standard of living are very tightly dependent upon and coupled to the consumption of fossil fuels. There is a 96% correlation between energy consumption and GDP.
2. It will take multiple decades to shift from fossil fuels to renewable sources of energy -- and we will need to keep burning fossil fuels in order to manufacture solar panels, wind turbines, etc.
3. Solar and wind will not replace the liquid fuels needed for transportation, esp. diesel for long haul trucking. Solar and wind will not replace the 9 or 10 calories of fossil fuels that are behind every calorie of the food we eat.
4. Global fossil fuel production is beginning its decline, beginning with petroleum.
5. Decline rates may be in the range of 6% - 8%. Which mean petroleum production will be half of what it is currently in 9 - 12 years
6. The "Hirsch Report" [*Peaking of World Oil Production: Impacts, Mitigation, and Risk Management* (2005)], created by request for the U.S. DOE, indicated it would take two or more decades to mitigate for the decline of petroleum -- we have lost those two decades and hence are woefully ill-prepared
7. Coupled with climate change, this means our food supply will be increasingly at risk
8. The 30-year Thrive plan should address these threats as top priorities - it does not
9. The best strategy, both to improve regional food security as well as to increase the resilience of agriculture in the face of climate change, is to shift to regenerative agriculture and grow more of our table crops locally. The content of Thrive should keenly focus on that strategy.
10. While the Thrive plan recognizes the importance of the Ag Reserve, the plan should also emphasize urban agriculture and the creation of several regional hubs for wholesale agricultural markets.

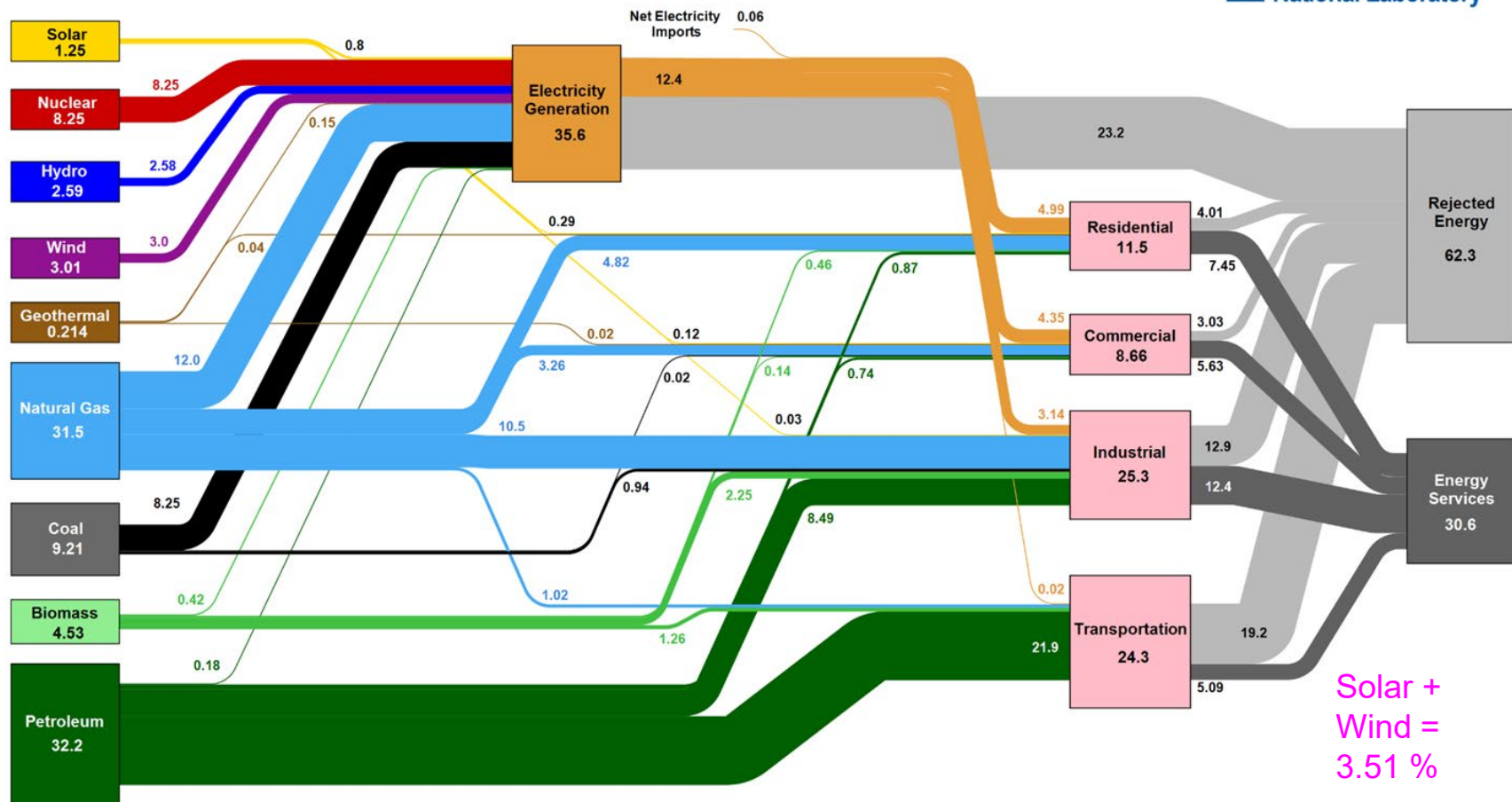
1. Our society's systems and standard of living are very tightly dependent upon and coupled to the consumption of fossil fuels. There is a 96% correlation between energy consumption and GDP.

The next two slides show the U.S. and Maryland energy flows.

By summing the amounts of energy generated from solar and wind and the dividing by the total energy for the U.S. or the state, the percentages shown in the lower right corner of each slide in magenta have been calculated: 3.5% for the U.S., and less than 1.4% for Maryland.

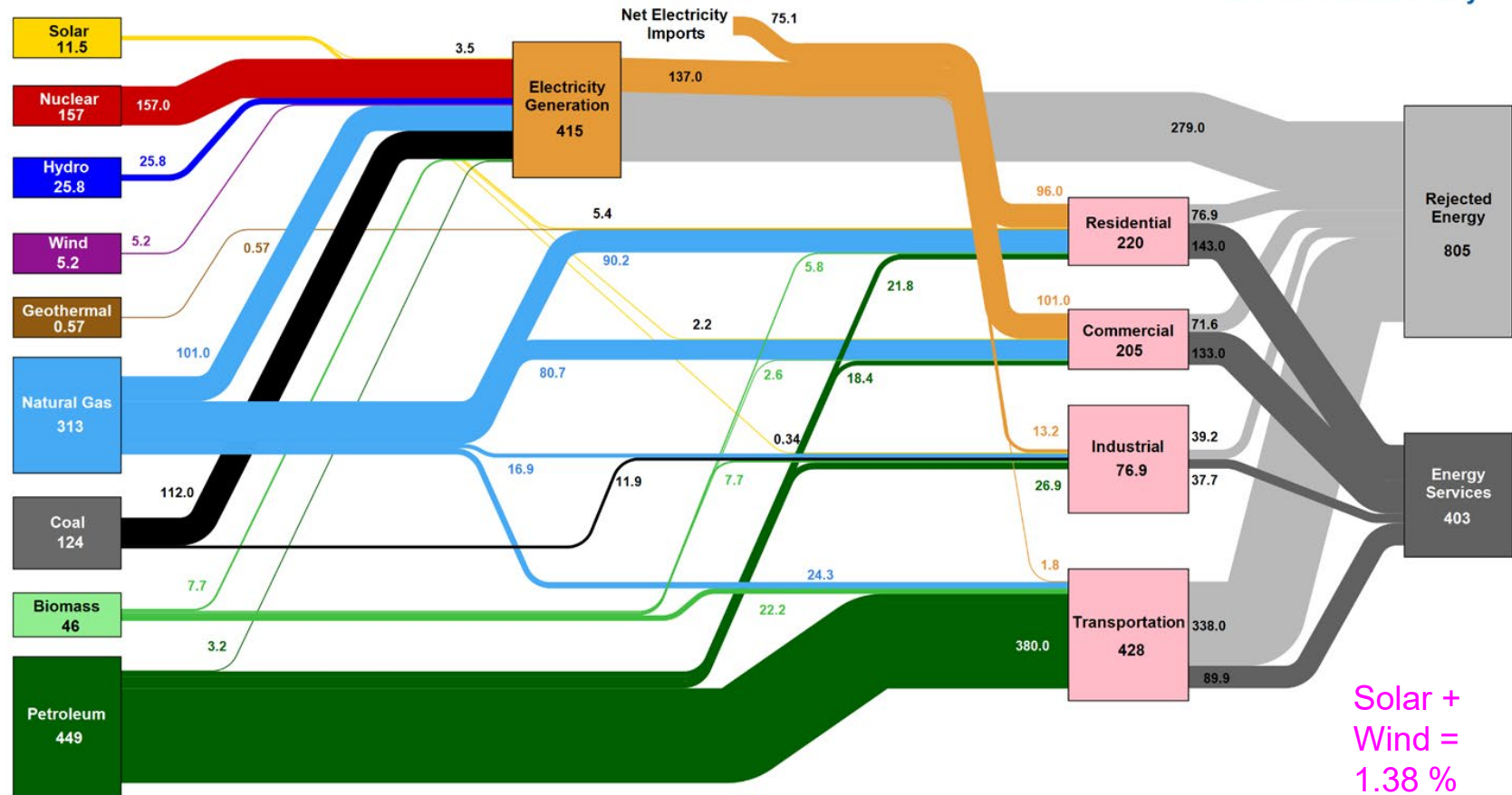
Point: Very little of our energy is supplied by solar and wind.

Estimated U.S. Energy Consumption in 2020: 92.9 Quads



Source: LLNL March, 2021. Data is based on DOE/EIA MER (2020). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential sector, 65% for the commercial sector, 21% for the transportation sector and 49% for the industrial sector, which was updated in 2017 to reflect DOE's analysis of manufacturing. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

Estimated Maryland Energy Consumption in 2018: 1,208 Trillion BTU



Source: LLNL June, 2020. Data is based on DOE/EIA SEDS (2019). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential sector, 65% for the commercial sector, 49% for the industrial sector, and 21% for the transportation sector. Totals may not equal sum of components due to independent Rounding. LLNL-MI-410527

2. It will take multiple decades to shift from fossil fuels to renewable sources of energy -- and we will need to keep burning fossil fuels in order to manufacture solar panels, wind turbines, etc.

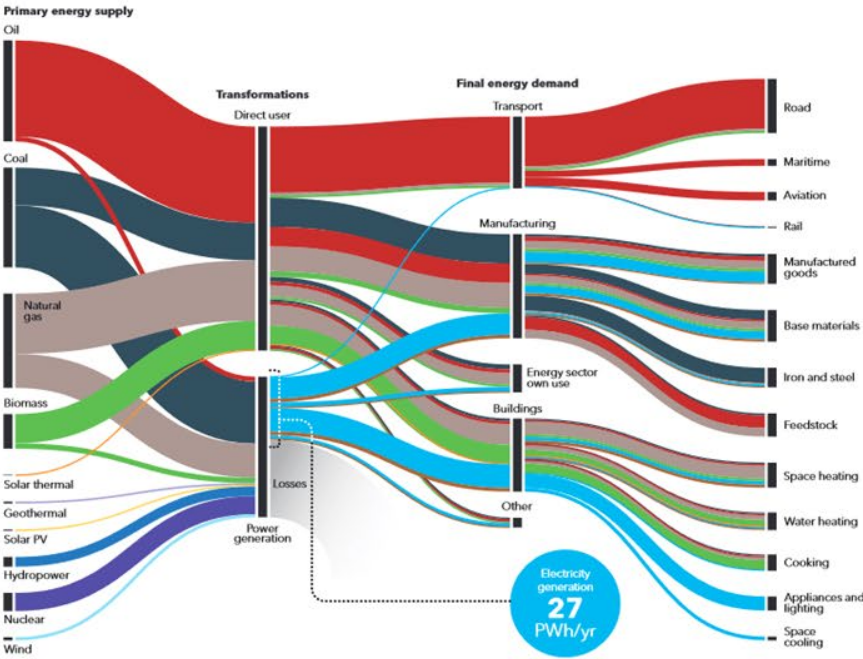
The next slide was generated from in-depth modeling to ascertain how quickly renewables could be increased in scale, and fossil fuels reduced. The left panel shows where the world is in 2018. The right panel shows where we might be able -- with a lot of effort -- to be in 30 years time by 2050. Note that coal, oil, and natural gas are still nearly 50% of our energy mix!

Point: It is going to take decades to wean ourselves from fossil fuels. Emissions will continue to be with us for a long time.

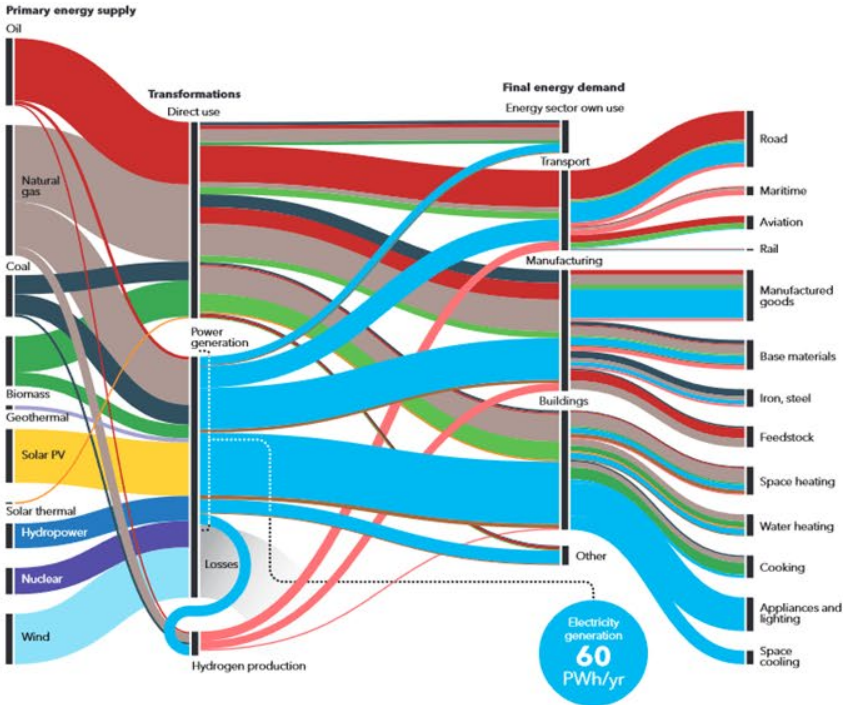
COMPARISON OF ENERGY FLOWS: 2018 AND 2050

- Biomass
- Coal
- Direct heat
- Electricity
- Geothermal
- Hydrogen
- Hydropower
- Natural gas
- Nuclear fuels
- Oil
- Solar PV
- Solar thermal
- Wind

2018



2050



3. Solar and wind will not replace the liquid fuels needed for transportation, esp. diesel for long haul trucking. Solar and wind will not replace the 9 or 10 calories of fossil fuels that are behind every calorie of the food we eat.

Please read these studies by Alice Friedemann:

When Trucks Stop Running: Energy and the Future of Transportation

<https://energyskeptic.com/2016/when-trucks-stop-running-so-does-civilization/>

Life After Fossil Fuels: A Reality Check on Alternative Energy

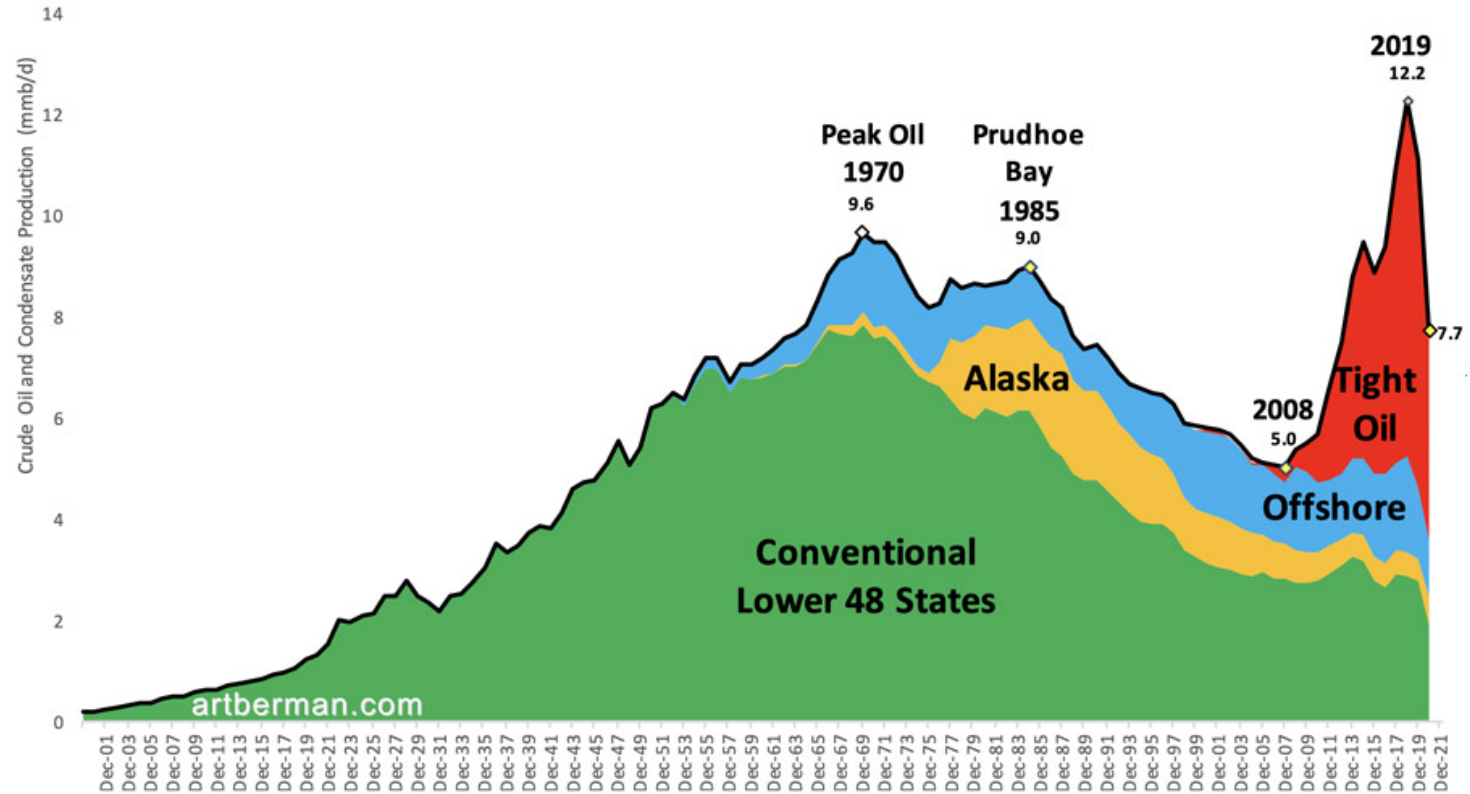
<https://energyskeptic.com/2021/biomass-updates-to-life-after-fossil-fuels/>

(email pbogdonoff@gmail.com to request PDFs of these books)

4. Global fossil fuel production is beginning its decline, beginning with petroleum.

The next set of slide shows the likely future of global petroleum production (slide 10), the rapid decline of U.S. fracked oil production (slide 11),

U.S. Crude Oil and Condensate Production and Forecast



Source: EIA, Enverus & Labyrinth Consulting Services, Inc.

EIA Current/Monthly Updates/CRUDE OIL PRODUCTION ANNUAL AND FORECAST

“Balloon” Graph from Charles Hall & colleagues

A key concept is Energy Return on Energy Invested (EROEI) -
https://en.wikipedia.org/wiki/Energy_return_on_investment

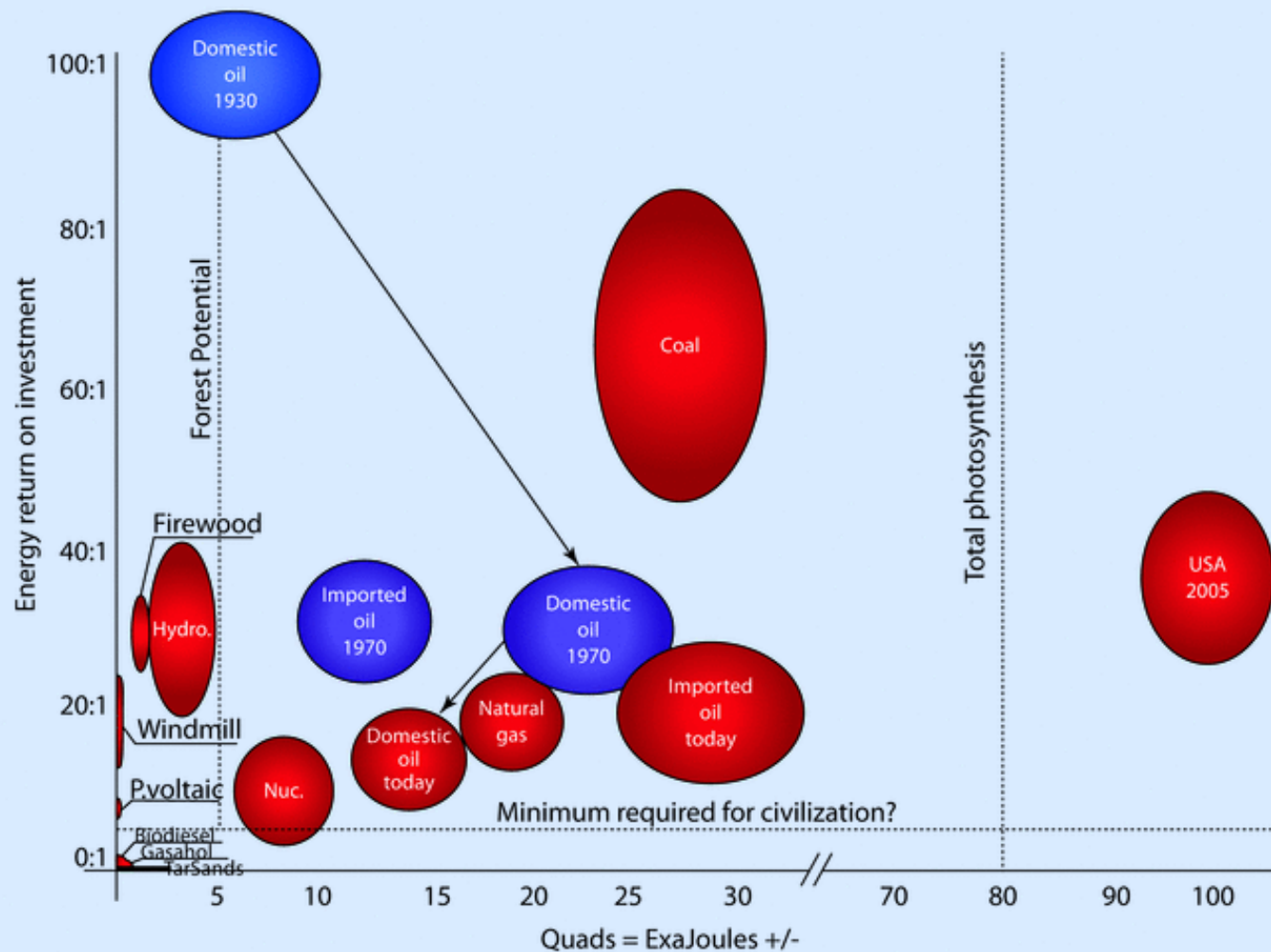
The follow graph shows that when petroleum was first extracted in the 1930s (blue balloon), the equivalent of one barrel of oil invested would return 100 barrels.

In the 1970s (purple balloons), that return on investment had already dropped to 40 to 1.

And recently, that EROEI has dropped below 20:1 (red balloon - “Domestic oil today”).

The other red balloons show EROEIs for other sources of energy. Note that renewables have a much, much lower energy “density” than fossil fuels.

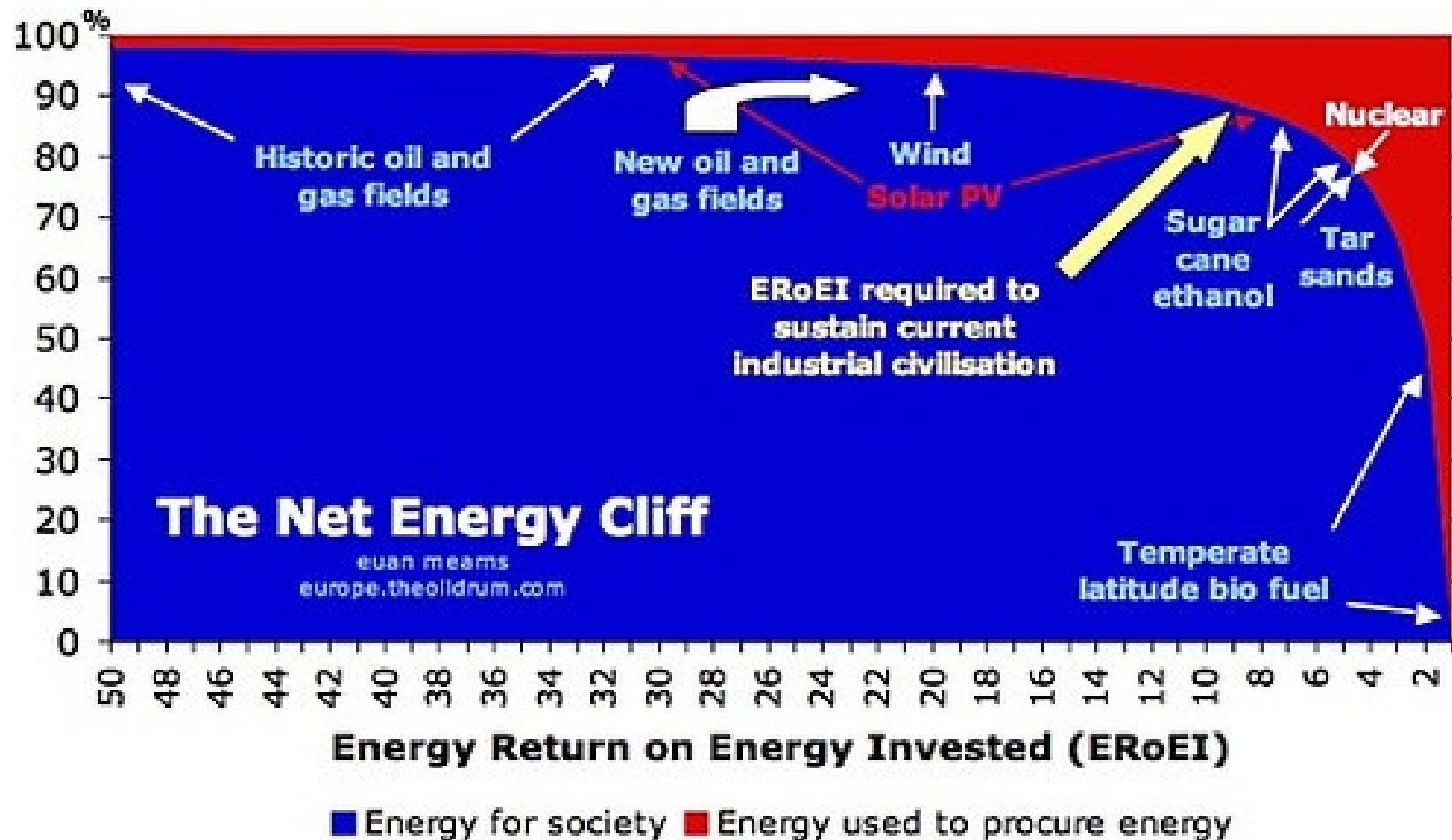
It is worth time to study this graph, and to understand the implications as the EROEI of our energy declines.



The Net Energy “Cliff”

The following graph displays some of the information from the balloon chart in a different way. It can be clearly seen that for energy sources with lower EROEIs, more effort or energy must be expended by society to get the energy, which means less of the harvested energy is available for society to use for its other purposes (e.g., education, health care, governance, constructing buildings and roads, etc.).

Charles Hall and his colleagues who have studied how economies depend on energy initially thought that an EROEI of 7:1 would be needed to maintain a semblance of civilization. They have subsequently increased that to closer to 20:1.

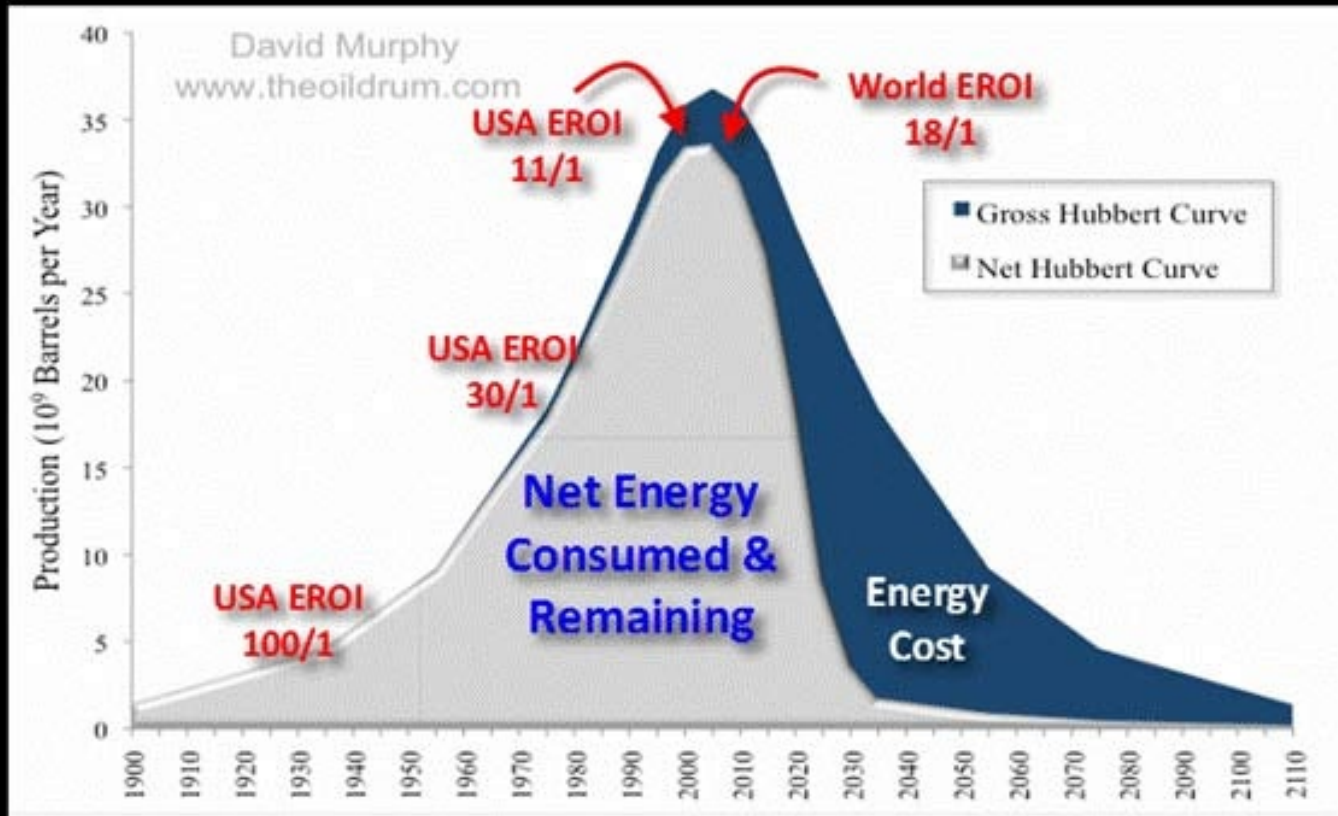


Another view of petroleum energy descent

The next slide shows in graphic form how the last 100 or so years of civilization has benefited from petroleum obtained at low cost (it had a high energy return on investment), but that as we head into the future, after having exploited all the easy to find and produce sources of petroleum, we will be extracting oil with lower and lower EROEIs (we will need to spend more to get less). The decline in the availability of energy to fuel society will be dramatic.

5. Decline rates may be in the range of 6% - 8%. Which mean petroleum production will be half of what it is currently in 9 - 12 years. https://en.wikipedia.org/wiki/Rule_of_72
6. The “Hirsch Report” [*Peaking of World Oil Production: Impacts, Mitigation, and Risk Management* (2005)], created by request for the U.S. DOE, indicated it would take two or more decades to mitigate for the decline of petroleum -- we have lost those two decades and hence are woefully ill-prepared. https://en.wikipedia.org/wiki/Hirsch_report

The Falling EROI: The Destroyer of Net Energy



SR Srocco

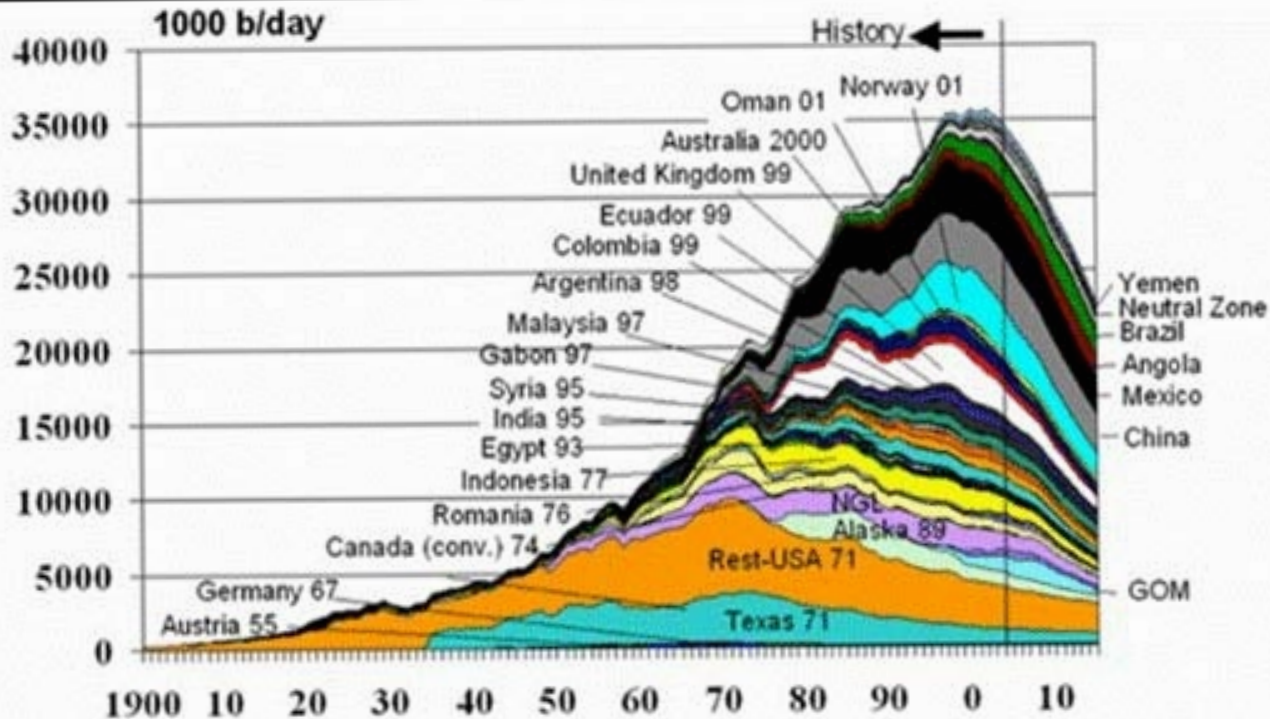
graph from David Murphy - theoil drum.com

Most oil producing countries have passed peak production

The next slide shows which countries have passed or will pass their peak of petroleum production.

The two slides that follow next show the declines being experience by BP and Exxon Mobil, respectively.

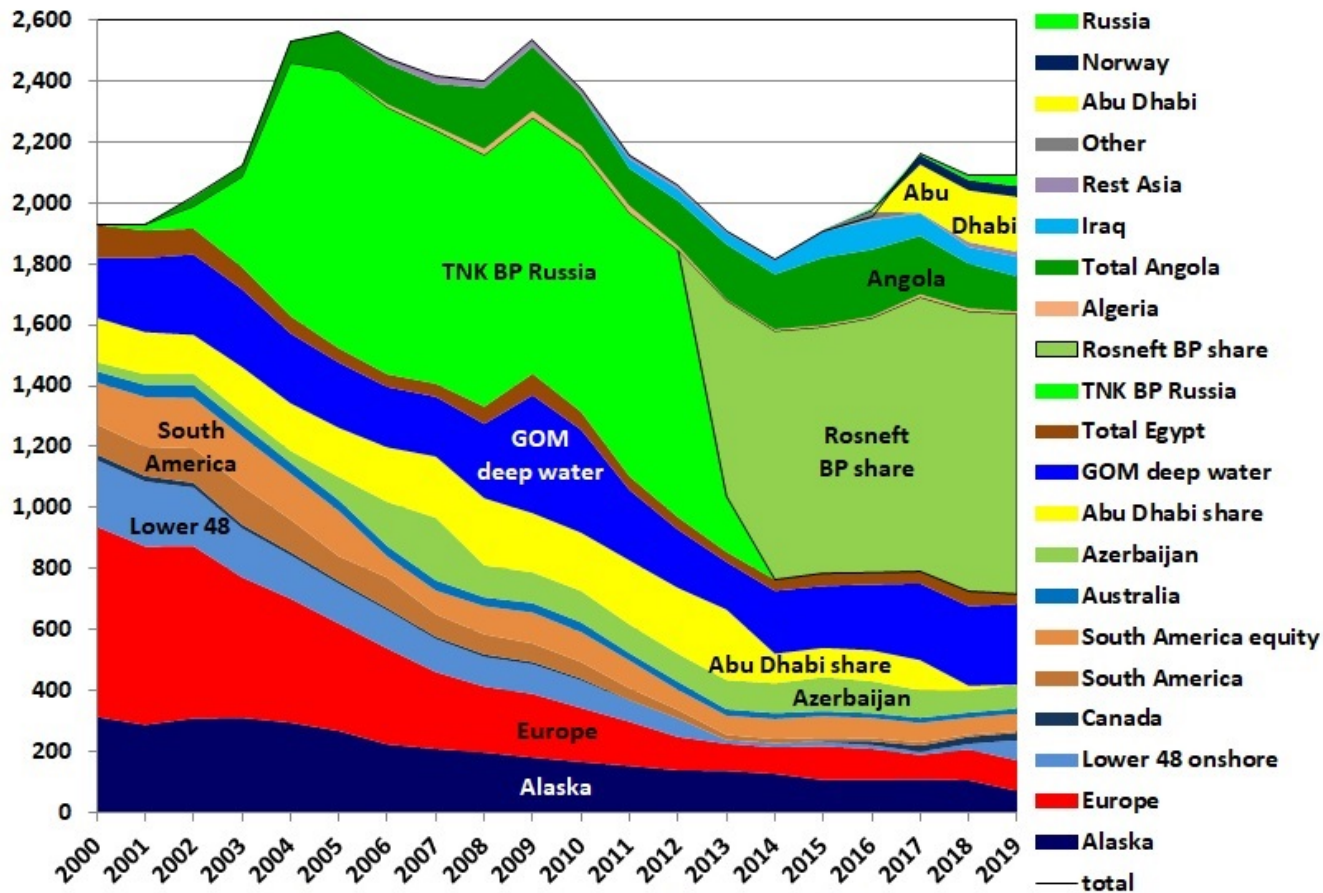
List of Countries Past Peak Oil



Dats source: IHS 2003, BP Stat Rev 2004;
2004: LBST estimate on Jan-Aug data
Analyses and Forecast LBST

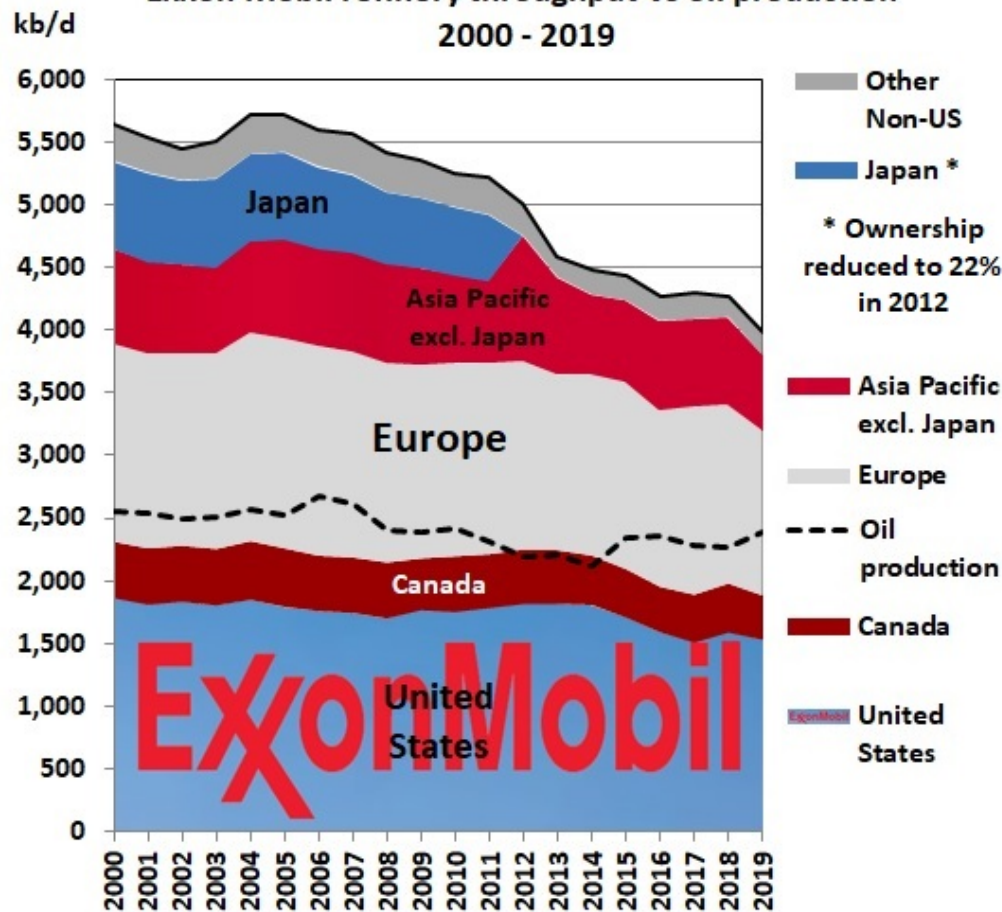
kb/d

BP crude production by region 2000-2019



Source of data: BP annual reports, financial & operating information

Exxon Mobil refinery throughput vs oil production 2000 - 2019



Source of data: Exxon Mobil Form 10K

Recent headlines showing production is declining

The next two slides capture some recent headlines reflecting the decline in petroleum production being acknowledged by oil companies.

Recent headlines

ANALYSIS

Australia loses another oil refinery, leaving our fuel supply vulnerable to regional crises

By business reporter [Gareth Hutchens](#)

Posted Wed 10 Feb 2021 at 12:51pm, updated Wed 10 Feb 2021 at 4:09pm

In the space of four months, Australia has lost half of its remaining oil refineries.

In October, BP announced it was closing its Kwinana oil refinery in Perth and converting it into a fuel import terminal.

Recent headlines



Royal Dutch Shell says it is already past peak oil.

In a Thursday press release, the company said "oil production peaked in 2019," and that it expects an annual decline of 1% to 2% per year. That's something Shell has anticipated for some time, ...

https://www.greencarreports.com/news/1131263_shell-admits-it-s-past-peak-oil-eyes-carbon-offsets-as-a-business-opportunity

Some implications for the Thrive 2050 plan:

- Declining petroleum availability (for transportation and farm inputs like fertilizer, etc.) coupled with climate change, indicate that our food supply will be increasingly at risk
- The 30-year Thrive plan should address these threats as top priorities
- The best strategy, both to improve regional food security as well as to increase the resilience of agriculture in the face of climate change, is to shift to regenerative agriculture and grow more of our table crops locally. The content of Thrive should keenly focus on that strategy.
- While the Thrive plan recognizes the importance of the Ag Reserve, the plan should also emphasize urban agriculture and the creation of several regional hubs for wholesale agricultural markets.

Thank you

Philip Bogdonoff

philip.bogdonoff@bio4climate.org

Marty Reese <martyreese@mail.com>February 28, 2021

From: Philip Bogdonoff, Montgomery County resident, pbogdonoff@gmail.com

To: Adriana Hochberg, Assistant CAO and Climate Change Coordinator, Montgomery County, Adriana.Hochberg@montgomerycountymd.gov
Stan Edwards, Division Chief, Division of Env. Policy & Compliance Montgomery County, stan.edwards@montgomerycountymd.gov
Doug Weisburger, Senior Planning Specialist, Sustainability Programs, Montgomery County, Douglas.Weisburger@montgomerycountymd.gov

cc: Marc Elrich, County Executive, Montgomery County, OCEmail@montgomerycountymd.gov
climate@montgomerycountymd.gov
and other interested parties

Re: **The need to address climate migration in Montgomery County's Climate Action Plan**

I am a resident of Montgomery County. I have, as a number of you know, been active as a participant in one of the County's Technical Work Groups (Adaptation & Sequestration), and as well as with a number of other groups and associations that are concerned about climate change. I offer the notes and thoughts below as, hopefully, a useful contribution towards addressing the issue of climate migrants and refugees in the County's Climate Action Plan. Based on that research I believe people displaced by climate events (rising sea level, extreme weather) and direct and indirect economic forces driven by climate change will have a very significant impact on the County's ability to carry out its CAP goals. Thus, the issue of how to anticipate, plan for, and ultimately take care of climate migrants should be considered to be an integral part of the County's planning and policy discussions. I asked the County on a couple of the County's climate virtual office hours this past fall how the Plan being drafted was going to address the issue of climate refugees. I was told it was not addressing the issue; on one of the latter calls, I was invited to submit further information. I have done some preliminary research, identified others with more knowledge than me, and begun conversations with some of them. What follows is a memo assembling what I have found to date. Given that I plan to continue reaching out to other experts, I also have included the next background section for their information.

Again, I hope this memo will be seen as a useful start to begin addressing the issue.

Background

Montgomery County, Md., was one of the very first political jurisdictions in the world to declare a climate emergency on December 5, 2017.¹ The Emergency Climate Resolution, after a preamble, stated:

The Montgomery County Council calls upon the national Administration, the Congress, the State, and other local governments to join Montgomery County, to use all available powers and resources to:

¹ <https://www.montgomerycountymd.gov/green/Resources/Files/climate/Montgomery-County-Climate-Action-Resolution.pdf>

1. *declare a climate emergency and initiate a massive global mobilization to restore a safe climate and build a sustainable economy; and*
2. *transform the climate by reducing greenhouse gas emissions by 80% by 2027 and reaching 100% elimination by 2035, and initiate large-scale efforts to remove excess carbon from the atmosphere.*

The Montgomery County Council calls upon the Montgomery County Executive, Montgomery County Public Schools and Maryland-National Capital Park and Planning Commission to advise the Council over the next six months on specific methods for accelerating the County's greenhouse gas emissions reduction goal.

After a year lost when Council members were campaigning for election or re-election, newly elected County Executive Marc Elrich hired Adriana Hochberg as his Assistant CAO to lead "Montgomery County's efforts to combat climate change and coordinate[] the development of the Climate Action Plan, a strategic roadmap for the County" Beginning in the summer 2019, the first three Technical Working Groups were formed, composed of citizen volunteers with the assistance of various county staff persons, to come together in a series of meetings to formulate recommendations in the areas of Buildings, Clean Energy, and Transportation. Towards the end of that summer, two additional Working Groups were formed, focused on Adaptation & Sequestration, and on Public Engagement. The collected recommendations from those five groups, nearly 860 in all, were conveyed to the County in February of 2020. The County then hired two consultant companies, AECOM and Nspiregreen, and tasked them with reviewing, evaluating, prioritizing, and organizing those recommendations, as well as to address additional areas of concern (diversity & equity, and governance), and preparing a Climate Action Plan. The first draft of that Plan was released in early December 2020 and can be found here:

<https://www.montgomerycountymd.gov/green/Resources/Files/climate/draft-climate-action-plan.pdf>

Other documents and events related to the County's climate efforts can be found here:

<https://www.montgomerycountymd.gov/green/climate/index.html>

The Issue

The word "refugee" appears **only once** in the draft Climate Action Plan. It is mentioned on page 41 as a component of the CDC's Social Vulnerability Index (SVI). The word "migrant" is not mentioned at all; "immigrant" or "immigrants" are mentioned eight times, but not in any direct climate-related context. The word "migration" appears in the included Emergency Climate Resolution only in reference to mosquitos.

Given that a) climate migrants from other countries and as well as the number of internally displaced migrants are already relocating to the Washington, DC region (see articles below), b) local government services are affected by the needs of such relocating people, c) our region is likely to continue to be an attractive geography for relocation, and d) Montgomery County's Climate Action Plan will affect the policies and spending of the county and its people for the coming decade and longer, therefore e) the Climate Action Plan should anticipate and plan for how to accommodate climate refugees and migrants that are coming and will continue to come to the County.

Climate Migration Drivers

Climate migration is complicated to unpack. Decisions to move are often made as a result of numerous factors, and those factors—political, social, economic, and environmental—interact in complex ways that confound definitions and lead to confusion and debate among academics and practitioners.

But one thing is clear—**climate change will increasingly drive migration**. This includes **migration due to climate-induced food and water insecurity**, increasingly severe weather events, and more severe and frequent disease outbreaks. And much of that migration will be to cities across the globe.

...

Scaling Urban Innovations is Critical

C40 Cities helps cities secure more finance from global bodies to support climate action and implement programs that enable cities to share data. In collaboration with the Mayors Migration Council—a group of city mayors working to empower cities to prepare and manage migration—C40 Cities is using their networks of leaders to influence international policies and improve urban planning and innovation to prepare for climate change.

...

Source: Lopez, Linda, and Blake, James. (2020, Oct. 19). *Climate Migration and Cities: Preparing for the Next Mass Movement of People*.

The climate migrant / migration issue is also a climate justice issue.

Interviewee Jalonnie White-Newsome, a climate justice advocate and researcher, reminds Pogue that extreme weather events disproportionately hit communities of color, yet these same people are the least able to move. She also explains that the decision to migrate - or not - is complex and difficult to predict.

Source: Tower, Amali, and Plano, Ryan. (2021, January 31). *Climate Displacement in the News*. Climate Refugees.

Planning for “durable solutions” and adaptation is an important component.

“Despite the well-designed programmatic approach to implement durable solutions, unless a climate change adaptation strategy is delivered at the regional and local levels, we may expect further climate change-induced displacement.”

Source: Ambika, Chawla. (2021, Jan. 14). *People are being displaced by the impacts of climate change — how can cities cope with newcomers?*

Migration has already started and is going to increase.

Migrations have already started in the face of droughts and hurricanes, and the situation is likely to get worse.

Source: Herrmann, Victoria. (2018, June 6). *U.S. Cities Need to Plan for an Influx of Internal Climate Migrants.*

No state will be unaffected.

By the end of this century, sea level rises alone could displace 13m people. Many states will have to grapple with hordes of residents seeking dry ground. But, as one expert says, ‘No state is unaffected by this.

Sourc: Milman, Oliver. (2018, Sept. 24). *'We're moving to higher ground': America's era of climate mass migration is here.*

Where migrants go can make sense -- and also be surprising.

After [Hurricane Maria](#) hit Puerto Rico in September 2017, thousands of people fled the island. The exact headcount, and how many of those moves were temporary or permanent, is hard to nail down. Budget data from [cell phone records](#), [federal aid requests](#), [school enrollments](#), and other indicators tell a story of mass migration. Florida, especially the Orlando area, was by far the top landing spot. New York City and Philadelphia, both with strong existing Puerto Rican communities, were also popular.

But a less obvious metro area also drew in thousands of evacuees: Buffalo, New York.

Source: McDonnell, Tim, and Shendruk Amanda. (2020, Sept. 1). *How cities can prepare to support climate migrants.*

The number of people displaced is large and increasing.

Climate change accounts for **over 35%** of displaced people across the world. Global warming is impacting every corner of the world, ... Since 2008, climate change has forced an average of **26 million people** a year from their homes: in the most vulnerable regions—sub-Saharan Africa, South Asia, and Latin America—**over 140 million people** could be forcibly displaced by 2050.

Source: Fogel, Rebecca. (2019, Nov. 20). *Climate Migration and Global Cities*.

In 2018, more than 1.2 Americans were displaced by the effects of climate change.

Climate migrants—people displaced by the far-reaching effects of climate change—already exist in the United States. They include homeowners wading through the **process for buyouts** of flood-prone homes, **families evacuating** during climate-exacerbated disasters, and the **families moving en masse** from places experiencing environmental and economic changes.

Just last year, **16.1 million people** globally were displaced because of weather-related disasters. More than 1.2 million of those displaced were Americans. **Journalists** and **policymakers** are paying greater attention to this issue.

Source: Martin, Carlos. (2019, Oct. 22). *Who Are America's "Climate Migrants," and Where Will They Go?*

A Beginning Set of Questions to Address

Regarding climate migrants, what are the issues that should be faced by a County government, as well as the general populace, including its businesses, schools, non-profit sector, and assistance agencies?

What have other plans identified as issues for their cities? What have they included in their plans as ways to adapt, mitigate, plans for, etc. the expected influx of climate refugees/migrants?

Are there different types of refugees/migrants that will need to be accommodated:

- Those who have the wherewithal to “flee” comfortably and can afford to relocate
- Internally displaced by climate-related disasters
 - Sudden disasters: storms, floods, tornados, etc.
 - Slower moving: sea level rise; increasingly hot weather affecting living conditions, loss of ability to farm due to salt water intrusion, etc.
- Might portions of Montgomery County’s population become temporary “refugees” due to flooding, extreme heat / wet bulb temps, loss of power, or other climate-related issues?

- Refugees from outside our region or even outside the U.S. due to weather crises, or even political crises driven by climate change (e.g., as were many of the Syrian refugees (see Amery (2019), Blitzer (2021), Holleis (2020), Mansharamani (2016))

What recommendations should be included in the CAP regarding new or growing services agencies that may be needed (e.g., relocation assistance for housing, jobs, police and emergency services, healthcare, mediation, education, job training) and what funding levels may be anticipated?

The County is currently (due to COVID) already experiencing limits on tax-based funding, and likely will continue to experience budgetary limits. What might the Plan recommend in the way of policies – executive orders and/or legislation – to leverage its political leadership role to motivate the private sector and other institutions – such as schools & colleges, religious institutions, and associations – to plan and prepare for stepping into expanded and new roles?

Where might we misstep in our planning? At least one report highlights “Anti-Displacement Activities That May Increase Community Vulnerability to Climate Change” as well as “Anti-Displacement Activities That May Increase Community Resilience to Climate Change” (see Gregg and Braddock, 2020).

What potential disasters might require County resources:

- Fire
- Flooding
- Storm damage within the county (e.g., derechos)
- Storm damage in the region (e.g., hurricanes, “northeasters” and/or other “snowmageddon” type storms

Who or what would need to be mobilized?

- Civil defense and other County and private disaster relief services (fire, police, emergency medical services, hospitals, Red Cross); housing of refugees by schools, churches, other large facilities
- Communications
 - Emergency communications
 - Messages from County leadership

What are key threats to Montgomery County?

The ProPublica article by Shaw, Lustgarten, and Goldsmith (2020), *New Climate Maps Show a Transformed United States*, ranks the issues facing Montgomery County, MD, on a scale of 1 (slight) to 10 (extreme) as:

Farm Crop Yields 5
 Economic Damages 4
 Heat 4
 Wet Bulb (humidity) 4
 Sea Level Rise 1
 Large Wildfires 1

These issues will have impacts that create refugees from our own region.

Preliminary Recommendations for Montgomery County's Climate Action Plan

These beginning recommendations are largely based on a telephone conversation I had on Feb. 22, 2021, with Patrick Marchman, who is Climate Resiliency Project Manager and Practice Lead at Kleinfelder in Kansas City, Missouri.² He followed our conversation with an email (Appendix A: Some thoughts on climate migration impacts to Montgomery County). Mr. Marchman was recommended to me by Kayly Ober, Senior Advocate and Program Manager of the Climate Displacement Program at Refugees International.³

"Climate refugees" will come from a) overseas, esp. Central America, b) other parts of the U.S. -- such as from New Orleans after Hurricane Katrina, and from Houston after Hurricane Harvey; and there will be c) domestic climate migrants -- "These people generally won't move because of a single Hollywood-ready disaster. You can think of it as a steady trickle of people who decide to move due to climate effects, whether from diminished economic prospects at home, urban/regional breakdown, or perceived risk. This may be less visible but is likely to be much greater than the first two categories. Another category, d) is local relocation: This last category contains people already in the DC metro area. Parts of DC itself and several of its suburbs and neighboring cities are quite low-lying. You may see a simple perception of desirability growing due to Montgomery County not being as vulnerable than some other areas.

Some of these migrants will be well-resourced. Others may be indigent.

Potential impacts for planning

Housing: Due to migrants, some parts of the County may be perceived as safer, endowed with better services, or likely more resilient (e.g., to heat events) and therefore become more attractive and drive up real estate values. Other parts of the County, conversely, may experience declining values. This shift in real estate valuations may have consequences for capital investment in transportation and other infrastructure, schools, and businesses. It will have implications for any housing policy the County wants to support, as well as equity and justice issues.

Economic development: "Diversification will probably be the key as climate stressors grow and collide with increased financialization and AI-ization of the economy. The overall global system will be more and more unstable... As climate puts more stress on governments, it would be best to find ways to diversify from government and government contracting, as there is a chance that governance itself will change greatly. Capital will also be looking for safe, resilient jurisdictions to invest in and to create jobs in and migration will follow that capital."

² Patrick Marchman - <https://www.linkedin.com/in/patrickmarchman/>

³ Kayly Ober - <https://www.refugeesinternational.org/kayly-ober>

Public utilities and services: “Climate migration into the county will increase stress on utility systems already under stress due to other climate impacts - increased precipitation, etc. This will make developing resilient and hardened infrastructure that much more important to the county. ...”

Transportation and planning: “With increased migration, further urbanization and densification of communities within Montgomery County will be much more sustainable and easier to maintain against climate impacts than traditional suburbanization. Zoning and other means of encouraging denser, more sustainable and more economical development should absolutely be employed as soon as possible. ...”

Q: Is there one main thing to focus on?

A: Yes, affordable housing, ...

Q: What else can my town do to prepare?

A: Climate migrants will require services of all kinds. Schools need to be ready to welcome new students. City social services need to be ready to provide counseling. If there’s a local nonprofit experienced with refugees, get involved.

Q: What will climate migrants mean for my town?

A: In a positive way. Since at least the Great Recession, towns around the country have been looking for ways to jump-start their economies. Here’s a chance to welcome vibrant new communities to your town—people who can fill jobs, pay taxes, open restaurants and make art. And at the same time, you’ll be helping them out. Forward-thinking towns around the country see this as an opportunity.

Source: ANS Editors. (2019, Fall). *Why Towns Should Prepare for the Climate Displaced*.

If preparations are not adequate, climate migrants can put stresses on communities and become sources of conflict.

Where do they go?

Many studies overlook this important question. Evidence suggests that counties most likely to become permanent resettlements are nearby, have lower unemployment and higher wages, and are more urban.

Preliminary analysis of recent disasters by Urban colleagues bear this out. For example, most movers after California’s 2015 and 2017 fires had moved to the neighboring counties and were still living there a year after. In contrast, though, a large portion of Puerto Rican migrants

following Hurricane Maria were living farther away in Florida.

How are they received?

Migrants' perceptions of their new communities is a [mixed bag](#). Some studies report [satisfaction \(PDF\)](#) with their adopted neighborhoods, while [others](#) show that the maintenance or breaking of social ties partially shape how the migrants integrate.

Receiving communities, for their part, seem to be welcoming at first, offering the “[warmth of those who care](#)” followed by “[the tools they need](#).”

But this welcome wears quickly, and long-term underpreparation starts to [show](#). Future receiving communities have few incentives to prepare for, build capacity for, and integrate newcomers—especially while addressing their own climate-related resource gaps.

Consequently, newcomers are perceived as [competitors](#) for jobs and housing—especially where these were already tight. Existing [financial](#) and health service providers become overwhelmed and often underresourced for the specific needs of the migrants. Particularly when newcomers differ by race and income, they are [increasingly](#) and [inaccurately](#) blamed for all kinds of problems.

Source: Martin, Carlos. (2019, Oct. 22). *Who Are America's "Climate Migrants," and Where Will They Go?*

The material which follows is mostly bibliographic, organized under a number of headings I hope are useful.

Definitions

environmental migrants - are people who are forced to leave their home region due to sudden or long-term changes to their local environment. These changes compromise their well-being or secure livelihood, and include increased drought, desertification, sea level rise, and disruption of seasonal weather patterns (such as the monsoons[1]). Climate refugees may flee or migrate to another country, or they may migrate internally within their own country.[2] Though there is no uniform and clear-cut definition of environmental migration, the idea is gaining growing attention as policy-makers and environmental and social scientists attempt to conceptualize the potential societal effects of climate change and environmental degradation.

Source: https://en.m.wikipedia.org/wiki/Environmental_migrant

climate refugee - a person who has been forced to leave their home as a result of the effects of climate change on their environment. "climate refugees are facing the prospect of abandoning their village due to erosion and sea level rise"

Source: Dictionary.com

Climate Refugees is a 2010 American documentary film, directed and produced by Michael P. Nash. The documentary attempts to cover the human impact of climate change by considering those who could most be affected by it. ... The film attempts to illuminate the national security implications of countries running out of food and water due to vast droughts and climatic shifts. ...

<http://www.climaterefugees.com>

Source: https://en.m.wikipedia.org/wiki/Climate_Refugees

climigration - climigration is the planned relocation of entire communities to new locations further from harm. Source: <https://theconversation.com/climigration-when-communities-must-move-because-of-climate-change-122529> ; see also: <https://www.climigration.org/>

National Security Threats of Climate Change and Climate Migrants

A number of reports recognize the national security threat posed by climate change, including the issue of migrants. Here are two from the Climate Reality Project:

The Climate Crisis is a Threat to National Security | Climate Reality

<https://climateresalityproject.org/blog/climate-crisis-threat-national-security>

Climate Justice 101: Climate Migration | Climate Reality

<https://live-climate-reality-project.pantheonsite.io/blog/climate-justice-101-climate-migration>

Other significant reports:

Brock, Steve, and Loomis, Deborah. (February 10, 2021). *Climate 21 Project: Department of Defense*. https://climate21.org/documents/C21_Defense.pdf [This memo is part of the Climate 21 Project, which taps the expertise of more than 150 experts with high-level government experience, including nine former cabinet appointees, to deliver actionable advice for a rapid-start, whole-of-government climate response coordinated by the White House and accountable to the President. The full set of Climate 21 Project memos is available at climate21.org.] Excerpts follow:

- "... Adaptation and resilience planning will need to address more effective water management, changes in agricultural practices, planning for migration, clean energy transition, and dealing with extreme weather events. ..." [Report of the Defense Science Board Task Force on "Trends and Implications of Climate Change for National and International Security," Office of the Undersecretary of Defense for Acquisition, Technology and Logistics, October 2011, Executive Summary.]

- “... In addition to individual or unit professional military education, DoD should use existing fiscal authorities like 10 U.S.C. § 32127 to conduct and pay for joint climate security training exercises with partner militaries and security forces to achieve interoperability that advances U.S. interests in strategic areas of the world which are particularly vulnerable to climate threats. Examples would be training around mass migration and instability triggered by water and food shortages, traditional humanitarian relief exercises simulating natural disasters, as well as more technical exercises around construction of natural and built infrastructure to increase resilience. ...” [10 U.S.C. 321 Training with Friendly Foreign Countries: Payment of Training and Exercise Expenses.]
- Referring to Africa: “... Poor land-use policies, changing weather patterns, rising temperatures, and dramatic shifts in rainfall contribute to drought, famine, migration, and resource competition. ... The reduction in arable land for crops and grazing land for livestock has created strong competition between the region’s farmers and herders who migrate across borders searching for usable land. ... Armed groups and criminal networks exploit this situation, leading to human trafficking, slavery, and more violence.” —General Thomas Waldhauser, then commander of U.S. Africa Command, February 2019 [Quote from AFRICOM posture statement to SASC February 7, 2019: General Thomas D. Waldhauser, United States Marine Corps available at https://www.armed-services.senate.gov/imo/media/doc/Waldhauser_02-07-19.pdf.]

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“... Q: Is there one main thing to focus on? Yes, affordable housing, ...

Q: What else can my town do to prepare? Climate migrants will require services of all kinds. Schools need to be ready to welcome new students. City social services need to be ready to provide counseling. If there’s a local nonprofit experienced with refugees, get involved. ...”

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Wet Bulb Globe Temperature, Latest + Forecasts

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Note: This article has the details for the US by county. In the areas of impact considered by the article, Montgomery County, on a scale of 1 (slight) to 10 (extreme) rates: Heat 4, Wet Bulb (humidity) 4, Farm Crop Yields 5, Sea Level Rise 1, Large Wildfires 1, and Economic Damages 4.

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Arctic News: More Extreme Weather

Feb. 3, 2021

<http://arctic-news.blogspot.com/2021/02/more-extreme-weather.html>

Washington, DC + Annapolis Region Sea Level Rise

Find your state's sea level rise - Sea Level Rise

<https://sealevelrise.org/states/>

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... The tool includes:

- Interactive local projections of sea level rise and increasing coastal flood risk from 1-10 feet by decade;
- A zooming, zip-searchable map of low-lying areas threatened, plus layers showing social vulnerability, population density and property value;
- Detailed assessments of populations, property, infrastructure and contamination sources exposed, for each implicated county, city, town, zip code, planning district, legislative district and more;
- State- and county-wide heat maps facilitating high-level vulnerability comparisons; and
- Brief customized “fast look” reports that integrate key findings from across all analyses for each locality, and provide interpretation and context.

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... Across Maryland, a recent NOAA study shows the frequency of flooding is dramatically increasing in vulnerable areas like Cambridge, Tolchester Beach, Baltimore City, Annapolis, and Solomons Island. For example, projections for Baltimore City show 5-9 days of flooding will occur in 2020, 15-25 days in 2030, and 50-155 days in 2050. Flash floods, like those experienced in Ellicott City, result in millions of dollars of damage and lost lives. With the growing risk, the return on investment for flooding mitigation has

increased from \$4 savings to \$6 savings for every \$1 invested. In 2020, for the first time ever, communities were eligible to apply for a new Federal program for funding disaster resilience projects BEFORE the next natural disaster. ...

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Climate Action Plans or Cities That Are Anticipating Climate Migrants

Anchorage, Alaska, and Los Angeles, California (among others)

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Ft. Collins, Colorado

2012 Municipal Sustainability Annual Report

<https://www.fcgov.com/sustainability/files/2012-sustainabilityannualreport.pdf>

See p. 39:

- Climate Refugees August 28, 2012 • 8:30-9:56 pm CSU Gardens, 630 Lake Avenue
Climate scientists predict that hundreds of millions of people will be uprooted as a result of rising sea levels and extreme weather events, droughts, and desertification. Where will they go? Climate Refugees explores the devastating political impacts of environmental refugees due to climate change, whether it's human-caused or not. 86 min.
- Climate Refugees September 19, 2012 • noon-1:26 pm 215 N. Mason - 3D
Climate scientists predict that hundreds of millions of people will be uprooted as a result of rising sea levels and extreme weather events, droughts, and desertification. Where will they go? Climate Refugees explores the devastating political impacts of environmental refugees due to climate change, whether it's human-caused or not. 86 min

[Searches for Climate Action Plans that address climate refugees or migrants for the following cities were not fruitful: Boston, Mass.; New York, NY; Miami, FL.]

Organizations

Climate Mayors

<https://climatemayors.org/>

Climate Refugees

<https://www.climate-refugees.org/>

Mayors Climate Protection Center - United States Conference of Mayors

<https://www.usmayors.org/programs/mayors-climate-protection-center/>

U.S. Mayors Report on a Decade of Global Climate Leadership (December 2015)

<http://www.usmayors.org/wp-content/uploads/2017/06/1205-report-climateaction.pdf>

(The term “climate refugees” is mentioned once on p. 22.)

Mayors’ Commission on Climate Change [Sacramento and West Sacramento, Calif.]

https://www.How_Will_Climate_Refugees_Impact_National_Security?.lgc.org/climatecommission/

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Executive Director

Climigration

<https://www.climigration.org/network-leadership-kristin-marcell>

Lara Whitley-Binder

Possible Topics for Further Research

"Living Shorelines"

<https://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2016/05/living-shorelines-a-key-line-of-defense>

Loss of farmland due to sea level rise

<https://www.google.com/search?q=loss+of+farmland+to+sea+level+rise+in+maryland>

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Watters, Samantha. (Nov. 26, 2018). *Visualizing Farm Loss*. Maryland Today.

<https://today.umd.edu/articles/visualizing-farm-loss-6a296c40-4e00-4927-bdbf-607570d03ad1>

Appendix A: Some thoughts on climate migration impacts to Montgomery County

Wed, Feb 24, 2021 at 10:24 AM

From: Patrick Marchman

To: Philip Bogdonoff

Subject: Some thoughts on climate migration impacts to Montgomery County

Hi Philip -

Here's some thoughts that I hope you'll find helpful:

Climate migration in general -

There are multiple dimensions to this topic that will affect Montgomery County in different ways.

- Overseas "climate refugees": This will be in large measure similar to issues with existing refugee populations. The volume of people is likely to increase over time. It should also be noted that climate may not be the primary or even secondary cause of some of these refugee movements - for example, a country may have a civil war that was caused by tensions from crop failures that stemmed from climate. This is a real example, by the way, from the Syrian civil war. Note that "refugee" is a legal term that carries some controversy as countries are very reluctant to add a new reason (climate) for refugee status.
- Domestic "climate refugees": At least for the foreseeable future, most "climate refugees" will come domestically from other parts of the U.S.. This is along the lines of the diaspora after Hurricane Katrina from New Orleans.
- Domestic climate migration: These people generally won't move because of a single Hollywood-ready disaster. You can think of it as a steady trickle of people who decide to move due to climate effects, whether from diminished economic prospects at home, urban/regional breakdown, or perceived risk. This may be less visible but is likely to be much greater than the first two categories.
- Local relocation: This last category contains people already in the DC metro area. Parts of DC itself and several of its suburbs and neighboring cities are quite low-lying. You may see a simple perception of desirability growing due to Montgomery County not being as vulnerable than some other areas.

Potential impacts -

Housing: This is less straightforward than it might seem, but also with a much higher impact. It's not simply a matter of housing "refugees". If the housing market in places not directly on the shore gains value, then that refugee housing becomes harder and harder. There's a good chance Montgomery County housing will gain in value much more quickly than, say, Alexandria or Baltimore city housing which is much more obviously vulnerable. Beyond the borders of the county, real estate is where most Americans have the majority of their wealth, and insurance is starting to take notice of the huge vulnerabilities there. Uncounted trillions of dollars are sitting in coastal and coastal-ish real estate, and it is vulnerable to an even bigger crash than what was seen in 2008. That potential evaporation of wealth

could quickly reduce the purchasing power of millions, making it much harder for them to buy their way into a place like Montgomery County without radical changes to housing policy.

Economic development: Diversification will probably be the key as climate stressors grow and collide with increased financialization and AI-ization of the economy. The overall global system will be more and more unstable - COVID-19 can be thought of as almost a time machine forcing us all 10 years into the future in a few months. This won't be the last shock like that. As climate puts more stress on governments, it would be best to find ways to diversify from government and government contracting, as there is a chance that governance itself will change greatly. Capital will also be looking for safe, resilient jurisdictions to invest in and to create jobs in and migration will follow that capital.

Public utilities and services: Climate migration into the county will increase stress on utility systems already under stress due to other climate impacts - increased precipitation, etc. This will make developing resilient and hardened infrastructure that much more important to the county. While the U.S. birthrate in general is declining, increased migration might reverse that trend in Montgomery County, making it important for schools to prepare for continued growth.

Transportation and planning: With increased migration, further urbanization and densification of communities within Montgomery County will be much more sustainable and easier to maintain against climate impacts than traditional suburbanization. Zoning and other means of encouraging denser, more sustainable and more economical development should absolutely be employed as soon as possible. In terms of transportation, transit from Metro expansion, bus route modifications, and other modes (streetcars, bike lanes, etc.) should be prioritized and made as accessible as possible to as many people as possible.
