

Western Antarctic Ice Sheet Instability - Narrative

Edward stood on the drenched dock near his lighthouse watching the tide come in for the last time. Ever since he was knee-high, he loved watching the vast quantities of water flow in and out of the bay.

Only, this time, the water would never flow out again.

His cell phone was still in his hand. He couldn't remember if he'd hung up on Barbara or if she was still on the line. He couldn't stop repeating her words in his head.

Western Antarctic Rift System.

Marine Ice Sheet Instability.

Isostatic Rebound.

As a child in chronically underfunded schools in a half-abandoned fishing town, big words had scared Edward. Now, he was a full-fledged scientist, a leader in his field. He owned big words. But long ago, he'd learned the scariest things could always be expressed in small words and Barbara had only used two.

Total Collapse.

The whirl of a helicopter echoed throughout the night sky, but Edward didn't spot it until the beam of the lighthouse swung around. Edward stepped off the drowned dock joining the soldiers. After the helicopter, he was shoved in a jet, then a motorcade, and finally, the situation room at the White House. His rubber boots and rain jacket clashed with the suits and dress uniforms that filled the room.

The President leaned forward. "Last I heard, sea level rise was a problem for 2100. How did it change overnight?"

The meeting went about as poorly as any time politics meets science. The politicians wanted someone to blame, the military wanted someone to fight, and everyone was hoping this was secretly an opportunity. What they got instead was a blank face and a massive bill.

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"You told them to forget the budget?" Barbara was unimpressed. "You've been influenced by Johannes."

It was the off-season in Antarctica and his landing had been rough but at least this time, he was wearing situationally appropriate clothing.

"He's not that bad. You ready?"

Edward didn't bother unpacking his bags, he didn't have the motivation and he wouldn't be here long enough for it to make a difference. Instead, he and Barbara immediately went outside into the freezing dry air. They loaded their snowmobiles with supplies and headed toward the edge of the ice shelf.

"Is there a risk of calving?" Edward asked as he looked down a two-thousand-foot cliff of ice into the frigid Antarctic Ocean.

Barbara laughed. "Monica asked the same thing. Technically, it's already calved up there." She pointed to the distant peaks of the Transantarctic Mountain range. "But to answer your real question, we should be safe here. The iceberg over there just broke off."

Edward looked out at the just-broken-off "iceberg". It looked like a landmass, with ice and snow stretching from horizon to horizon. He swore he could see it moving, slowly drifting into warmer waters. "I don't even know how much ice that is. Billions? Trillions of tons? It's hard to imagine the ocean is only going to rise by ten feet from the ice melt."

"We're lucky there aren't very many volcanoes underneath the Eastern Ice Sheet. If it also collapsed, the world's oceans would rise by another hundred feet, but as far as we can tell it's still very stable."

It was good news. He should be happy, but where happiness was supposed to be was still numb, so he changed the subject. "By the way, our grant proposal has been approved. Unlimited budget."

"Kinda late, isn't it?" Barbara hopped back on the snowmobile. "The Western Ice Sheet has already collapsed. We're evacuating at the end of the season."

Edward got back on the other snowmobile. It paid to double up on transportation in Antarctica "It's not just us, both FEMA and the military have been given a blank cheque."

"Pretty sure the military already had a blank cheque."

"Now who's starting to sound like Johannes." Barbara laughed. Edward continued, blank-faced. "This time, it's payable to the Army Corps of Engineers. Speaking of which, I have a flight to the Netherlands to catch."

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The landscape looked like a bumblebee. Yellow bulldozer pushed rich black earth up the entire length of the dike. The Dutch had been preparing for this for a long time.

Johannes was shouting something over the construction noise. Edward signaled him further away from the roar of the excavators.

"What was it like standing on the biggest iceberg in history?"

"About the same. Mostly it was just cold."

Johannes rolled his eyes. "I meant could you tell it was floating? Could you feel the ocean beneath the ice sheet?"

"It's a piece of ice half the size of a continent. It wasn't exactly rocking in the waves. When is high tide?"

"It's always high tide now." Johannes laughed. Edward didn't.

"It's impressive you managed to survive the initial surge. I didn't know the Delta Works had three feet of spare protection."

"It was touch and go there for a while." Johannes led them to an onsite office trailer. "I'm still confused as to how the isostatic rebound happened so quickly. I mean, geologically speaking, it was the blink of an eye."

Edward removed his hard hat as they entered. "Technically, it's still going on."

Johannes shot Edward a sideways look.

"No need to worry." Edward sat down in a chair. "The worst of it is already over. Normally, the land would take much longer to bounce back after being pressed down by a mile of ice but that's because the ice melt is gradual. This time, the entire ice sheet was basically floated up overnight. That's the weight of a dwarf planet being lifted off the most volcanically active region on Earth. More than Hawaii or Iceland. The initial rebound was very quick, and

since all of that land is now underwater instead of under ice, its rise displaced enough water to raise the sea level by three feet almost instantly. The land will continue to rebound for centuries but that will be negligible compared to the ice melt."

Johannes fell into a chair. "The scale of it all is mind-boggling."

Outside the trailer window, the second shift switched with the third shift.

"Scale is what the Dutch do best." Edward played with his hard hat, stalling. "Do you think you'll be able to hold off the sea? How long can you keep up a 24/7 construction schedule? It's insane."

"I'll be cold and dead in the ground before I let the Netherlands fall beneath the waves. The very dry ground." Johannes laughed. Edward appreciated to joke but his face had forgotten how to smile. "Also, don't let Monica catch you saying someone does scale better than she does."

"Well, I'm visiting her next. Have you heard her plan?"

"Heard it, but I'm still struggling to believe it. You Americans built skyscrapers like we build playgrounds."

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Edward landed on a brand new runway at a brand new airport. He boarded a brand new train to a brand new terminal at the brand new city center. Monica was already waiting for him with a high-vis vest and hard hat.

"Army Corps of Engineers City 3?" He raised an eyebrow. "It doesn't exactly roll off the tongue, Monica."

"Like everything else in this city, the name is also incomplete."

They walked through the dense forest of cranes and half-finished skyscrapers. It was impressive but Edward just couldn't reach the emotion of impressed. "So, it'll get a proper name then?"

"They all will. The new residents will vote on it. I suspect we'll be getting a lot of old city names with New in front of them." She led Edward towards a break area.

"New New Orleans?" The words were out of his mouth before he realized it. Monica laughed at his joke, but he didn't.

"New Savannah. New Norfolk. New Baltimore. New Boston." She opened the door to a cafeteria and sat down. "Some cities like Tampa Bay and Atlantic City probably won't keep their names given their geographical nature, but I wouldn't count out the idea of Little Tampa Bay as a neighborhood in a larger city in the future."

Edward pulled out a chair and ordered a coffee with milk and sugar. "And the coastal defenses?"

Monica ordered a coffee, black. "Don't get me started on the coastal defenses."

"That bad?"

Monica waited until the coffee arrived and Edward was mid-sip before answering.

"Worst. Our coastal elevation data has an error of 10 feet."

He nearly spit out his drink. "You did that on purpose."

"Guilty."

In college, pranks between the two had been commonplace. Edward almost felt like himself again, only for it to be wiped away by the implication. "Doesn't that basically make the elevation data useless?"

"Functionally, yes. Some places we thought were going to flood during the initial three-foot surge didn't. The downside is a lot of places we thought were safe, weren't, and unfortunately, the error seems to be biased towards overestimating elevations which means the number of vulnerable locations is much higher than we initially estimated. Additionally, there are a lot of places that just aren't protectable. Miami and Honolulu are already lost causes. They were both nearly wiped out by the initial three-foot surge. Washington D.C. should be able to get by with dikes on the Potomac, but Baltimore and Annapolis are gone. Manhattan should be salvageable but Newark, Brooklyn, Queens, and large parts of Long Island will be underwater. And we haven't even begun to figure out what to do about the Bay Area. There's going to be a lot of animosity and hurt feelings."

They sat for a while as the TV played a silent presidential address. Edward gestured towards the TV. "As the President said, there are no good choices in a crisis, just choices."

Monica looked at the screen. "I'd hate to be him right now. This refugee crisis will make WWII look like a walk in the park. Up to a billion people displaced globally. Fifteen million in the US alone. Disease, riots, looting. I'm glad I'm building new cities and not relocating people. Argyl's been shot at a dozen times already."

"Fun. I'm going to see him next."

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"Put this on."

Edward caught the flak jacket. He was already struggling to keep up with the colonel's relentless pace without the heavy vest. He'd put it on when they stopped.

The colonel continued. "If they are wearing fatigues, consider anything they say an order. You move when they tell you, and you stop when they tell you. You are considered a high-priority target, and I will not have you getting yourself killed. Are we clear?"

"Crystal."

The forward operating base clashed with the suburban houses surrounding it, although the torn-up lawns covered with tire marks and treads helped. A Hummer pulled up and out popped Argyl.

"Edward, it's good to as hell see you."

"You too." He gave Argyl a once over. Shot at but not shot.

"I'm fine." He brushed off Edward, then motioned to the colonel. "But you won't be if he sees you carrying your bulletproof vest instead of wearing it." Argyl turned to the command tent, gesturing for Edward to follow. By the time they got in, Edward was weighed down by twenty pounds of ceramic and Kevlar. One of the inner tent walls was dominated by a large digital map.

"There's a lot of red on that map."

"There's a lot of assholes who live here."

Edward felt the hint of a grin cross his face. "Don't they realize their homes will be underwater soon?"

"No, in fact, they don't. Climate change is a hoax, remember? All of this," Argyl gestured broadly to the tent, soldiers, and military hardware. "This is just a government ploy to take their guns away."

"Can't they see all the beaches are gone?" Edward looked closely at the map. "Some of these houses must be flooded at this point."

"There's just no getting through to some people. I'd say let them drown if it wasn't my job to save them. Luckily, they're the exception."

Argyl led Edward back outside just as a transport filled with refugees pulled up. They boarded the truck, talking with the refugees the entire ride. They were scared, they were sad, but at the same time, they were kind and looking out for each other. It made Edward hopeful. After an hour, they arrived at a field of white-domed tents. It reminded Edward of the iceberg from Antarctica, white stretching from horizon to horizon as far as the eye could see.

"Where does it end?"

"Two counties over." Argyl grabbed a clipboard from an aid as they walked into camp. "This camp is now the fourth largest city in America. You're looking at the whole coastal population of Florida, not to mention the entire populations of a couple of former Island Nations."

"It's like we built our whole civilization with the intention of getting destroyed by sea level rise."

"Ain't that the truth." Argyl laughed. "Every port in the world is, or soon will be, underwater. Global trade will take decades to recover. On the bright side, domestic manufacturing is coming back!"

To most people, Argyl's "look-at-the-bright-side" comment might have been overlooked, but Edward knew it was a challenge. They'd played the listing game before.

"Green energy is set to become the main global energy source since no one can ship or receive oil."

"Social services are being adequately funded for the first time in forever."

"Cars are being phased out in the new cities in favor of rail-based public transportation."

"You're such a train dork."

"Trains are cool."

"Sure, they are."

They both stared out on the rolling hills of tents. Argyl had easily let him win. Still, it felt good sitting with his friend, watching people help each other.

"So, where you off to next?"

"Home."

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Edward stood on the gallery walk of his lighthouse, periodically bathed in a beam of light. His dock was fully submerged and unusable at this point, but he would build it anew.

The waves were well above the old high-water mark and the tide was still coming in. The sea level was normalizing at three and a half feet higher than before. However, the Western Antarctica Ice Sheet would soon begin to melt in earnest and the water would begin to rise again, slowly at first, then at a rate of an inch a month for the next decade.

He'd seen firsthand the disaster this sudden sea level rise had wrought but he'd also seen more cooperation and kind-heartedness than he expected. People came together in disasters. Kindness won.

Edward headed inside looking at a large set of blueprints. His lighthouse would be taken by the sea, there was no way to stop it, but he would rebuild, bigger and better than before. People always needed a light to guide their way in the dark.

Finally, Edward cracked a smile.