

Film Review: Snowpiercer

Seth D. Baum
Global Catastrophic Risk Institute
seth@gcrinstitute.org

Abstract: Popular fictional films can support sustainability education by bringing sustainability scenarios to life and appealing to wide audiences. One such film is *Snowpiercer*, a new film set in the aftermath of an environmental catastrophe. In this review, I cover a variety of themes in the film, discussing how they can be used for sustainability education. The themes include the geoengineering catastrophe that serves as the film's backdrop and the survivor's struggles to manage their limited resources. As a warning to the reader, the review also gives away the film's plot.

Keywords: film, *Snowpiercer*, geoengineering, social justice, resource depletion

Introduction

Anyone working in sustainability knows that human actions can radically and detrimentally alter the global environment. But it can be difficult to bring these abstract concepts to life in sustainability education, especially since the worst effects of environmental degradation have not yet occurred and thus cannot be shown in photos or videos. Additionally, certain sustainability messages tend to appeal mainly to a receptive minority, making it easy to preach to the choir. Film can be helpful at overcoming these challenges, especially film that is fictional or narrative, i.e. not documentary. Film can vividly visualize even the most fantastic-seeming futures, and can appeal to wide audiences (students and the general public alike) through story, action, and visual effects. In this article, I review a new film, *Snowpiercer* (directed by Bong Joon-ho and based on the 1980s French graphic novel *Le Transperceneige*), that is all this and more.

Here are some questions raised by the film: Should humanity attempt to engineer its way out of environmental degradation? Can a population survive indefinitely in a small space with no external resource inputs? Can resource scarcities be managed without resorting to violence? In this review, I will discuss questions raised by the film and show how they relate to real-world sustainability challenges. I will also comment on the merits of the film as a resource for sustainability education. Teachers, students, and even the educated general public should all be able to follow this review, albeit to varying degrees. Reader, be warned: This review gives away much of the film's plot, though it also suggests ideas to keep in mind when watching.

At the outset, it should be acknowledged that *Snowpiercer* is not mainly about sustainability issues. It is a mix of genres, including science fiction, action, and social critique. In this sense it is similar to films like *The Matrix* or *Inception* (see Baum and Thatcher 2010): there are fight scenes, but there are also a lot of quiet, pensive moments in which deep philosophical topics are pondered. The cinematography of *Snowpiercer* is quite beautiful, but it is refreshingly not an orgy of special effects. Instead, it is simply a good movie, a very enjoyable watch. And sustainability issues do make several rather explicit appearances, as do related issues of social structure and social justice. So, the film could reasonably be used in sustainability education as a starting point for discussing some key issues, as long as it is OK for students to spend most of their viewing time just enjoying the film itself.

The basic premise of the film is that an attempt at geoengineering fails catastrophically, resulting in a frozen planet. Geoengineering is the intentional manipulation of the global Earth system, typically in response to global warming (Caldeira et al. 2013). In the film, a coalition of 79 countries attempts to lower temperatures down to comfortable levels by putting a substance called CW7 into the stratosphere. The film's geoengineering is thus similar to actual stratospheric geoengineering proposals. But CW7 causes much more cooling than anticipated, killing most life across the planet. Only a few human survivors remain, living onboard a train called the *Snowpiercer*. While geoengineering sets the

backdrop for *Snowpiercer*, most of the film focuses on the trials and tribulations of the survivor population.

I will now give a general discussion of social justice and environmental sustainability as it appears in the film, followed by some detail about the CW7 geoengineering scenario. Throughout, I will relate the film to sustainability themes and research literature.

Social Justice and Environmental Sustainability

The main focus of the film is a struggle between social classes, which are strictly divided on the train. The front end of the train is wealthy; the tail end poor. Living conditions vary widely from section to section. Tail-enders live on protein bars made from pulverized insects; front-enders live on delicacies like steak and sushi. (While the train has an aquarium, no cattle ranch is shown. The steaks may thus come from in-vitro processes, which is essentially meat grown without the animal. In-vitro meat is an intriguing emerging sustainable technology; see Edelman et al. 2005; van der Weele and Driessen et al. 2013.) The physical structure of the train facilitates this rigid social structure, as the gates between each train car can be controlled by those in power, above all the train's mastermind, an industrialist named Wilford.

Wilford built the train and boarded it in anticipation of CW7's failure, loading what he could of humanity on board. The train is readily comparable to the lifeboat in Garrett Hardin's classic essay on lifeboat ethics (Hardin 1974). Hardin's essay argues against helping the poor on grounds that doing so would require exceeding the planet's resource base. While Wilford did permit some poor people on board his train, he granted them a bare minimum of resources on it. The industrialist-as-savior theme is also reminiscent of Ayn Rand's *Atlas Shrugged* (Rand 1957). But while *Atlas Shrugged* served mainly to praise the industrialist above all else, *Snowpiercer* offers more of a critique. *Snowpiercer's* plot centers around the struggle of tail-enders to overcome the harsh conditions imposed on them. The wealthier train residents are often singing Wilford's praises, but in a farcically overzealous tune. Even though Wilford did save humanity, the viewer does not come away with much respect for him.

The central plot element is a tail-ender revolt in which they seek to fight their way to Wilford's engine car at the front of the train, thereby gaining control of the train and enabling them to impose a more just order. The revolt succeeds despite extensive casualties, and the tail-enders reach Wilford by the end of the film. At this point, Wilford reveals that the revolt was actually a plan jointly crafted by himself and Gilliam, an elder tail-ender, in order to thin out the train's population to a sustainable level—more on the train's sustainability below. Wilford then offers Curtis, the revolt's leader, control of the train, noting that Wilford is getting to be too old for the job. Curtis refuses. Meanwhile, some of Curtis's associates set off a bomb that causes an avalanche, derailling the train and presumably killing most of its inhabitants. The film ends with two people walking outside in the snowy terrain, which is revealed to not be as lethally frigid as it was made out to be. A polar bear passes by in a sign of nature healing and life reborn.

It might be tempting to interpret the film's class struggle in Marxist terms. However, the tail-enders are not exploited as labor to any significant extent. Instead, the tail-enders are given their protein bars free of charge and generally left alone as long as they remain obedient. But the struggle is nonetheless a vivid illustration of social justice. The tail end's squalid living conditions are in stark contrast with the luxurious appointments of the front end. Wilford and his right-hand woman Minister Mason repeatedly articulate how everyone (and everything) on the train has its own proper place, and that this order is never to be violated. This is their core justification for their poor treatment of tail-enders, though it also seems to be a fiction, in that the tail-enders could be treated better without harming the train as a whole.

It is in the film's frequent and careful treatment of the rigid order of the train that sustainability issues most explicitly appear. Social and ecological order are both meticulously maintained so as to ensure the indefinite continuity of the train's population. The only resource obtained from outside the train is water, harvested from the ubiquitous snow deposits. Energy comes from a perpetual motion machine in the train's engine, the details of which are not explained.

One scene shows the twice-yearly serving of sushi and explains that this is the rate of fishing consistent with a stable fish supply. This shows the sustainable usage of a renewable resource. One can imagine that their usage rates were calculated using analysis reminiscent of that found in classic natural resource economics (Dasgupta and Heal 1979). This sort of sustainable usage is a feat seldom achieved in today's open oceans. While the oceans lack the same strict top-down governance as the train, contemporary sustainability research shows that this is not strictly necessary for successful governance of the commons (Dietz et al. 2003). The film thus raises the question of whether a totalitarian world government could be more successful at achieving sustainability. Perhaps it could, though perhaps it would come with other great sacrifices, for example to freedom and social mobility.

The film's depiction of fighting as population control is classic Malthusianism. The film even goes to the point of explaining that without fighting, famine would occur on the train, which would be even more miserable, thus the fighting is a good thing. One might wonder why, in such a tightly controlled community, population could not be regulated at the point of conception or pregnancy, but this is not considered in the film.

The train has an even darker story of resource scarcity, which Curtis tells towards the end of the film. When the tail-enders first boarded, they had no food. In desperation, they resorted to cannibalism. One could rather morbidly analyze cannibalism from the standpoint of natural resource depletion, showing an exponential decay in human body mass. The film gives the story a twist in which tail-enders, led by Gilliam, offer their own limbs as food in order to save lives. And before they run out of limbs, the protein bars are introduced, sparing them further cannibalism.

Of course, the narrow confines of the train pose very different challenges than those posed by the entirety of Earth, in terms of both resource constraints and social relations.

If anything, the train is perhaps most similar to the challenges expected on a spaceship—a real spaceship, not a metaphorical spaceship Earth. Likewise, astronautics must confront issues of natural resource management (Edwards 2013) and psychology (Vakoch 2011). If space colonization is to be successful, spaceship sustainability might be needed to a degree comparable to the sustainability maintained on the *Snowpiercer* train. And space colonization can play its own important role in the overall sustainability of human civilization and other Earth-originating life as it seeks to survive on Earth and spread broader across the universe (Baum 2010; 2013). So for many scales of sustainability, from the enclosed transport vesicle to the planet and beyond, *Snowpiercer* offers much to discuss in the context of sustainability education.

Geoengineering

Snowpiercer is unusual for taking place in a geoengineered world. I am not aware of any other films that do. Indeed, geoengineering is a relatively new concept, but it is one that is getting more and more research and policy attention as efforts to reduce greenhouse gas emissions are perceived as falling short. And so it is worth going into some additional detail about the particulars of the geoengineering in *Snowpiercer*. The film does not provide much detail about its geoengineering—just a brief explanation by voiceover at the beginning of the film. But this explanation is enough to compare the geoengineering in *Snowpiercer* to actual geoengineering research and policy proposals.

There are a variety of geoengineering proposals currently under consideration (Caldeira et al. 2013). Some involve large-scale removal of carbon dioxide from the atmosphere, such as by dumping fertilizer into oceans to stimulate plankton growth. Others involve blocking incoming sunlight, either by placing mirrors in orbit between the Sun and Earth, or by putting reflective particles into the stratosphere. Of all of these, stratospheric geoengineering tends to get the most serious attention. Stratospheric geoengineering is also the technique used in *Snowpiercer*, involving a fictional particle called CW7. The film's geoengineering scenario, while fictional, is quite timely.

Perhaps the most important difference between actual stratospheric geoengineering compared to that in *Snowpiercer* is that actual stratospheric geoengineering is unlikely to make Earth radically colder than intended. Particles could be added to the stratosphere incrementally, gradually lowering temperatures to a desired level. To radically overshoot desirable temperatures would require gross incompetence or extreme desperation. Perhaps the most plausible radical overshoot scenario would have people trying to cool the planet fast enough to avoid a large ice sheet collapse (Irvine et al. 2009) or other planetary tipping point (Lenton et al. 2008), and trying so frantically that they put in far too much of the particles. But this would still require so much incompetence that this scenario should be considered unlikely.

Relative to scenarios found in stratospheric geoengineering research, the scenario in *Snowpiercer* also shows temperatures remaining cold for an unusually long time. It is possible to keep cold temperatures indefinitely—if someone continues putting particles into the stratosphere. But after the catastrophic freeze in *Snowpiercer*, no further particles

would be put into the stratosphere. The particles would then gradually fall back out, causing temperatures to rise. For typical sulfate particles, temperatures would get most of the way back to normal after the first five or ten years (Matthews and Caldeira 2007). However, the film is set 17 years after CW7 was used and shows the outside world just starting to reach temperatures in which people do not quickly freeze to death. This suggests that CW7 is not sulfate. Other particles with longer stratospheric lifetimes have been proposed (Keith 2010); perhaps CW7 involves similar technology.

Regardless the technical details, the film does get one fundamental aspect of stratospheric geoengineering correct: while geoengineering could help with global warming, it carries large risks. Geoengineering researchers have identified many things that could go wrong with stratospheric geoengineering (Robock 2008). One major worry is that if people abruptly stop putting particles into the stratosphere, then, contra *Snowpiercer*, the ensuing temperature increase would be so rapid that it would cause great destruction (Matthews and Caldeira 2007). This worry would be lessened by using particles with longer stratospheric lifetimes, like CW7, because they would make the temperature increase slower. Of course, the fact that the temperature increase could be so destructive gives strong reason to not abruptly stop putting particles into the stratosphere. However, my colleagues and I caution about scenarios in which some other catastrophe, such as a major war or epidemic, hurts society so much that it is unable to continue geoengineering. Then the temperature spike is a second catastrophe hitting a population already weakened by the first one. We call this the stratospheric geoengineering “double catastrophe” (Baum et al. 2013). Such a scenario probably would not kill off life on Earth to the same extent as the *Snowpiercer* scenario, but it could be every bit as threatening to humanity.

The risks of stratospheric geoengineering raise a basic question: Should it be pursued? This depends on our expectations for the climatic conditions that would occur with and without stratospheric geoengineering, as well as our ethical values for comparing these conditions. Stratospheric geoengineering could avoid some of the worst effects of regular global warming (such as the effects depicted in Sherwood and Huber 2010), but it comes with a risk of an even larger catastrophe. If the effects of regular global warming start to get very difficult, then the risk of stratospheric geoengineering could look more and more tempting, posing a great dilemma (Baum 2014). The dilemma is apparent in the film as well: the CW7 geoengineering promised to help with regular global warming, but it ended up causing a much worse catastrophe. In hindsight, CW7 should not have been used. But without the benefit of hindsight, the decision is more ambiguous. This ambiguity is precisely what humanity actually faces with its actual stratospheric geoengineering decisions.

The screening of *Snowpiercer* I attended had director Bong Joon-ho present for a panel discussion after, and I got to ask him if he intended the film as any commentary on geoengineering. While he did not intend for the film to take a side on actual geoengineering decisions, he did intend for it to contrast between the artificial environment of the train and the natural environment outside. The train proves to be less durable than its passengers presume it to be, and meanwhile the outside world is gradually warming and healing. One point thus is that while technology can cause

environmental problems, nature can also find a way to come back. This does not mean that humanity can do anything it wants to nature with impunity. Indeed, even if nature recovers, humanity would not necessarily recover along with it. To the extent that we wish to sustain human civilization, we may need to keep the environment within reasonable bounds (Rockström et al. 2009a; 2009b; Baum and Handoh 2014). This is perhaps the most basic message to take from *Snowpiercer*.

Conclusion

Snowpiercer is both an enjoyable film in its own right and a compelling depiction of a variety of themes in sustainability and related topics. As such, the film can play a valuable role in sustainability education. Some of the topics covered are fundamental sustainability topics, such as the sustainable use of renewable natural resources (seen for example in the sushi scene). Other topics covered are more advanced, such as the evaluation of stratospheric geoengineering risk (in the opening scene, the film's premise). Because of this range, the film could be used for sustainability education at a variety of educational levels, from introductory to advanced.

In my opinion, *Snowpiercer* is best suited to introductory sustainability students. This is because the film is not mainly about sustainability. For most of the screen time, *Snowpiercer* is just a good movie. Advanced students are generally more motivated and thus do not need a good movie to peek their interest. For introductory students, and in particular students who may not be so motivated, *Snowpiercer* may be just right. It could be screened in introductory undergraduate courses, special campus events, adult education, or even advanced high school programs. I would suggest following the screening with a discussion of the film led by a sustainability educator. Such a screening could be a great way to teach a variety of important sustainability topics. It would also be good fun.

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