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MIKE Welcome to the *Free Range Podcast*. I'm your host Mike Livermore. The episode today is sponsored by the
LIVERMORE: Program on Law, Communities, and the Environment at the University of Virginia School of Law. With me today is Danae Hernandez Cortes, an economist and professor in the School of Sustainability at Arizona State University. She studies environmental justice and the distributional consequences of environmental policy. Hi, Danae, thanks for joining me today.

DANAE Hi, thank you so much for having me.
HERNANDEZ
CORTES:

MIKE So I'm really looking forward to our conversation today. Maybe just to get us started, obviously the US faces
LIVERMORE: serious levels of inequality on many fronts. There's inequality of income. There's inequality of consumption. There's also inequality in access to health care, education, personal safety. There's huge inequalities in how the criminal justice, criminal penal system works, and environmental inequality is definitely part of that picture.

I think it's fair to say that the field of economics generally has sharpened its focus on questions related to inequality in recent years in various domains. Do you think that's true in the field of environmental economics as well? Has there been more attention to issues around inequality, distribution, and justice recently than maybe in the past?

DANAE Yes, definitely, so we have a lot of-- as you said, there are many forms of inequality, but environmental inequality
HERNANDEZ is very particular because it's very well documented. And this is not something new, but it has been documented
CORTES: that despite this exists in many ways but particularly in where the pollution is located with respect to disadvantaged populations or vulnerable populations.

So this has existed in the past and many researchers, including researchers of color, have shown that this is the case. But I think that there has been a recent increase in interest from part of environmental economists and economists in general in understanding some of these causes and some of the policy incidents of different various economic and environmental policies that could affect pollution and could therefore affect who is exposed by this pollution.

MIKE Yeah, so there's a really interesting review paper that you're one of the co-authors on that reviews some recent
LIVERMORE: advances in the field, and I would-- yeah, I would recommend folks who are interested in that to take a look, but one of the research questions that maybe we could talk some-- generally about some of the advances in the field, but one that I found kind of interesting and that I wasn't personally familiar with compares environmental inequality or inequality in the environmental domain with inequality generally.

And that strikes me as a pretty interesting research topic. So some of the papers looked at things like comparing Gini coefficients, which is, of course, a measure of inequality in income typically and looking at Gini coefficients with respect to environmental exposures and comparing that to Gini coefficients with income more generally, so just general inequality in society.

So that's pretty interesting, and it seems like at least some of the times, environmental inequality is worse. The environmental harms are distributed more unequally than even income, which is already very unequally distributed in our society. And I guess the one thought is just what do you think about this research?

And normatively, I was trying to think, like, what do we want here actually? We have a certain amount of inequality in society. Do we want environmental quality to be distributed at the same rate as income inequality, or do we want it distributed more equally or less equally? What's the right normative framework for thinking about how to interpret these results?

**DANAE
HERNANDEZ
CORTES:**

This is a great question, and I think it's very hard to have an answer that is very precise because it's a normative statement. So these normative statements are difficult to compare without having an analysis of different policies and different policy alternatives.

But in general, income inequality has followed different distributions, and what we see in environmental inequality is that low income but predominantly minority communities are the ones that are exposed to more pollution. And this leads to sharp disparities in this distribution.

So if you look at gradients of income versus different levels of these communities and on how predominantly minority communities live there, we'll see that minority indicators are even more prevalent than income indicators. And that is a very important finding of a lot of this literature that, yes, it's true that income-- that low-income communities are exposed to more pollution on average.

But when you look closely, and you look at minority communities, that is even a bigger indicator of that. So that is the first finding that the literature has generally found, and the next question on how we compare the distributions of income and the distributions of environmental inequality. Well, I think that, one, the environmental inequality is related to different sources of inequality.

They could be correlated, but there are different sources. So we have zoning policies that affect where polluting facilities are located, and that affects the distribution of pollution in the environment. We also have different access to policy making that also affects what policies are implemented and who they target and which environmental policies are being implemented.

So we have different policies that are affecting the distribution of environmental inequality that are different from those that are affecting the distribution of income inequality, and so it's really hard to compare both. But in general, what we see is that even across dimensions of income versus race, you see that minority communities are the most affected by pollution in general.

**MIKE
LIVERMORE:**

So there's two things going on. So there's many different things going on it's fair to say. So there's-- you're right. There's a correlation between income and environmental exposure or exposure to environmental harms. And in a way, I think it's natural to think that the causal story runs from, say, income to environmental quality because the idea being, look, wealthier people can afford to move to areas that have cleaner air, that are less likely to have negative land uses nearby, and that kind of thing.

So that's one possibility. Another possibility is that environmental quality has a causal effect on income. So there's some research along these lines-- I understand-- that if you're exposed to lead pollution when you're young, that can have a serious long-term effects on all kinds of downstream consequences, including things potentially educational attainment, and that's going to affect income.

And there could be another variable that that's what you were saying is that there's something else-- maybe that's policy-- that affects both the distribution of environmental quality, or it affects both income and environmental quality in some way that leads to a correlation.

So that's pretty interesting. I mean, has there been-- what is the state of research to try to untangle those different possible causal-- and obviously, raised rates. I want to get to that as well but just to think about the income relationship first maybe.

DANAE
HERNANDEZ
CORTES:

Yeah, this is a great question, and it's often called the chicken versus the egg problem in environmental inequality, and there are a couple of people who have done research in the past related to that. And this idea that low-income communities could be restricted on where to find places to live. Those places that they are able to access because land could be cheaper are more polluted.

And if they are more polluted, then they have these other potential effects in the future into what are their outcomes. And so it's hard to understand what is the origin. It's either that people arrive to a place that is polluted or not, or people, certain groups, arrive there, and these facilities locate where those people are located already.

And so we have this chicken and the egg problem, and I think that there's a lot of economics literature that has tried to focus on understanding this origin. It's, of course, a very hard question to answer, but there's some literature that has found that it really depends on the type of pollution that you're looking at and the type of pollution that you're looking at and also the geographic-- the geography of the United States.

So there's some literature that has found it in Los Angeles, for example, in LA, some refineries arrived when low income and minority communities were already leaving. So that is something that some literature has found. But in other places of Southern California as well, we see that some communities arrive to places that were already polluted, and it's hard to disentangle.

So some work by Manuel Pasteur and other researchers in California have shown that this chicken and the egg problem is really difficult to understand. But there are some other recent literature that is trying to understand those processes more clearly.

So I heard that you have had Jonathan Coleman as part of the guest here in the podcast, and he has talked a little bit about how these different cycles occur and how moving to opportunity can be a way of trying to get away from not only some inequality in income but also some environmental inequality as well. So we see this in the literature, and there are some recent advances for that as well.

MIKE
LIVERMORE:

Yeah, yeah, as you say, it's not surprising that this is difficult to untangle. Any type of these deep causal questions are tough. It's not like we can run an experiment on any of these things, and so it's going to be difficult. It is interesting to consider that third possibility.

It's almost certainly-- it's just very hard to believe that some relationship from income to environmental quality isn't happening just because people-- the way I say this in my class is people who have money have lots of nice things that are nicer than the stuff that people with less money have.

And it just would be very surprising if environmental quality just didn't work that way in some respects, but then there's-- obviously, as you said-- there's citing decisions. There's this really real possibility that the environmental quality that you're born into has an effect on your downstream life prospects. So those are all totally very, very interesting areas of research.

But this idea that there's a third variable that could have-- honestly, I just hadn't considered this all this much but just imagine that you start off in a society-- theoretically, some kind of an imaginary equal society-- and then there's some policymaker that's doling out good things, including money and including environmental quality and then just preferentially doles out those two things to some people and not others.

There's going to be a correlation, but it's because of the doling out process. I mean, is that plausible? What do you think? Is that a story that the research community has considered and would it just be the discrimination in the policy process more broadly or is there something more specific that would lead us to think that that's what's happening is that there's this third variable that's leading to these correlations to show up in the data?

**DANAE
HERNANDEZ
CORTES:**

Yeah, this is a great question, and I think that this third variable, which is a greater number of policies. In this case, almost like a decision planner just coming and distributing pollution or income inequality could have different consequences.

And I think that how we-- these policies-- I think that this is going to be a little bit hard to answer, but I think that policies are not being implemented in isolation of the general distribution of where people are living. And some of the things that they have faced in the past and some of the inequalities they have faced in the past.

And so we are living in a society that is highly unequal in several fronts, and any policy or any potential intervention that could happen could have unequal outcomes just because of all of these historical inequalities. And I think that this is not directly answering the question.

But I think that it's important to understand because regardless of how that policy is implemented, it might have unequal outcomes because of the fact that there's this long history in the relationship of environmental and income and race inequality that is happening in the background.

**MIKE
LIVERMORE:**

Yeah, absolutely, the interaction with race here is maybe illuminating. If it was just an income sorting story where wealthy people go to the places that have higher environmental quality and people who are less well off go to places where it's less expensive to live, and that often means lower environmental quality. That wouldn't explain why there's-- as you said, race is also predictive here.

So if you run a regression, and you're trying to figure out what-- you're looking at correlations between income and environmental quality, including race, that regression is going to improve the performance of the model, which is telling us that race is a factor above and beyond income.

Personally, I've always thought that misses part of the story, the fact that race is so closely correlated with income. We shouldn't just kind of pass that over as, OK, well, we just accept that or something. That itself is real bad, and we should-- that it's quote, unquote, "only income" helps explain some of the variation in the racial correlations.

It doesn't mean it's not normatively problematic. But in any case, I think it does maybe tell us something about the mechanism perhaps because there's not really such a clear sorting story with respect to race as there might be with respect to income.

DANAE
HERNANDEZ
CORTES: Yeah, but there has been some policies that have particularly been trying to exacerbate these disparities in the access to some housing. And I want to point out one important piece of research that Peter Christensen and Chris Simmons have been trying to-- that have published, and it has been very interesting and is when you--

The places where people are able to access in terms of where they live, also depends on these characteristics on their income but also on their race. And so it's important to note that if people have a restricted set of alternatives on where they are going to be able to move to, then they also have restrictions into which type of environment they are able to even get to live.

MIKE
LIVERMORE: Yeah, that's absolutely true. Yeah.

DANAE
HERNANDEZ
CORTES: Yes, so it is very interesting, but this relationships are really hard to disentangle. And I think that that's why some of the current environmental literature and environmental economics literature has been trying to understand that, and it's also at the same time that we have started to understand and leverage some of the incredible data that is collected out there that we can leverage to understand this question. So we're in a very interesting point in time to study all of these questions.

MIKE
LIVERMORE: Yeah, absolutely, absolutely, just the point that you were just making is completely right and just to emphasize that, obviously there's housing discrimination. And so that is going to interact with income. Now just in the vein of our general conversation here about the relationship of income inequality, environmental inequality, and maybe other kinds of inequality.

So I'm going to guess, although I don't know, and this is outside your immediate area of research so it's perhaps not a totally fair question. But my guess is that there's going to be other areas like this where there's going to have almost exactly the same setup like have. There's income disparity in access to health care. There's income disparity in treatment by the criminal justice system.

There's income disparity in educational quality that people have access to, and then race on top of income is going to be predictive, even controlling which is to say, even controlling for income, there's still going to be racial disparities. And so it sounds like-- again, environment just follows this same pattern that we see in these other domains.

DANAE
HERNANDEZ
CORTES: Definitely, definitely, and I think that one interesting fact about the environment is that any policy that-- well, many policies that could target the improvement of the local environment will be place based in general. If you are trying to say increase access to help hospitals, maybe you do it in a larger state or in the whole country.

But sometimes, local environmental policies have the potential to really affect the people who are living in those communities. So I think that it's true that environment-- environmental inequality-- will be alongside all of these other sources of inequality. But I think it's a little bit different in the sense of how this relationship between some of the citing decisions, some of the nature of the pollution problem as well.

And actually, I would like to mention some part of my research. Part of my research is also trying to look at these other disparities and how they interact with environmental disparities. So I have one working paper together with Kyle Meng trying to understand what is it. Is it health disparities, or is it environmental disparities that is preventing-- what is the main factor that is happening.

And we see it very clearly in California where environmental disparities have definitely been declining. If you see too some pollutants, not others, but if you see some pollutants, some of these disparities have been declining, but health disparities haven't.

And so this is very interesting because if we think that environment explains health, but we don't-- but we see environmental disparities reducing and health disparities not reducing then maybe we're not targeting the right sector. So it is very interesting, and all of that, overall, is interacting.

And it's hard to answer what part is health disparities, what part is housing discrimination, what part is income inequality. But all of them are likely happening in the background but having these tools of causality that economists often have for analyzing these questions is important to leverage and trying to answer these questions.

**MIKE
LIVERMORE:**

Yeah, that's super interesting. So I want to talk about this PM stuff. I actually want to get back to-- there's so many interesting things to talk about because I want to get back to this notion of what is tied to place and how much inequality is driven by place and how much of it is driven by other things and correlations between characteristics and places.

That just strikes me as a really interesting thing to talk about, but anyway, with respect to that research that you were just mentioning, one of your recent papers that I was looking at is leveraging this huge decline in particulate matter exposure from the electricity generating sector, which is just-- we don't celebrate this enough.

So maybe you can give us the numbers. But in the last 20 odd years, there's really been just a staggering reduction in exposure to particulate matter, which is a really serious pollutant that causes-- is associated with premature mortality. So maybe we could tell the happy story there, and then, yeah, maybe unpack that work on the relationship with inequality.

**DANAE
HERNANDEZ
CORTES:**

Yes, of course, and in this paper, it is a paper together with [INAUDIBLE] and Paige Weber, and we're trying to understand what are the main drivers of the reduction of particulate matter coming from the electricity sector.

And what we see is that this particulate matter concentrations have decreased a lot, around 89% for the average individual in the US.

**MIKE
LIVERMORE:**

Which we should just pause and say that's a 90% reduction, and this is between 2000 and 2018 or thereabouts, right?

DANAE
HERNANDEZ
CORTES: Exactly, exactly, and that is impressive in and of itself because if you compare it to the overall pollution-- say, all of the potential sources-- all of the other sources have also declined. If you look at the pollution concentrations that you see in monitors that capture all sources it has also been declining, but we don't see the same rate as in the case of the electricity sector, which is impressive.

And that has been a combination of many factors. Some of them are driven by policies that are targeting air quality such as improvements in emissions intensities, improvements in the technologies that the power plants use, et cetera. But there's also other policies that are happening.

So these changes of coal to natural gas and the eventual change of renewables have also probably led to some of these changes as well. We don't look at some of these renewable energy but in terms of this transition from coal to natural gas has also decreased inequality as well.

And so this paper is trying to disentangle what are the potential changes of pollution coming from these different sources, but not only in terms of pollution, but also in terms of disparities to that pollution. So we calculate also how disparities have changed between different minority and income groups. And we see also different convergences in those disparities. So we do see these convergences in disparities as well.

MIKE
LIVERMORE: Yeah, which is really good news that we see disparities going down. But as you note, that's a very interesting finding that doesn't seem to be affecting disparities in health. And I guess there could be a couple of different possible stories there. One that would be like an extreme skeptic.

I'll just articulate it even though I find it implausible is that environmental quality or air quality isn't affecting anybody's health. And so the fact that you've reduced-- you've improved air quality, and you've reduced disparities, it just isn't mattering in some sense because the link to health is not there.

That I just find very implausible just because there's such a strong evidence base for that. So what the heck's going on? Is it just that there's so many other things that air pollution is an important component of health, but there's so many other things that affect our health that even if you reduce-- when you improve the air, it does impact our health.

But it's just going to be hard to measure. There's going to be a lot of noise because so many other factors or is it that other sources of health inequality have increased and then made up for the reduction in environmentally-related health inequality or what's the story there? What do you think is going on?

DANAE
HERNANDEZ
CORTES: Well, I think that is a question that we are still trying to understand, but let me tell you that the literature has consistently found that improvements in environmental quality lead to improvements in health.

So it's hard to believe that this is one of the reasons that we're seeing what we see, but one thing that could be the case is that there are disparities in health access that have been very prevalent that prevent people from accessing the care that they need in the case of pollution exposure.

And that can be the case, but there's also another strand of literature sure that tries to understand what is the role of cumulative inequities that could be leading to these disparities. And I think that is one part that could be happening as well that is not only exposure to health but also what is the-- it's not only the exposure to pollution in your census tract, but it could be the quality of your house, the level of insulation.

It can also be what is the type of exposure that you have on a daily basis. Is that changing because of income or race? So for example, if some groups are more exposed to pollution because they work outdoors, that could be affecting the exposure, and therefore affecting health disparities as well. So it's hard to believe that it could be a story of only the environment.

I think that is all of these other things that could be potentially affecting health disparities, what is happening in the background. And hopefully, our work in this field will allow us to answer some of these questions, and we're hoping that we are able to disentangle what could be driven by environmental disparities decreasing and what can be driven by other disparities in health access.

MIKE LIVERMORE: Yeah, part of the problem, of course, is that these are time-correlated variables. So there's just so much else going on at the same time. So even if we're reducing one source of inequality, it's possible that there's another source of inequality that is increasing in the same time over the same time, and then it washes out when you look at health effects.

DANAE HERNANDEZ CORTES:

MIKE LIVERMORE: Yeah, yeah, yeah, very, very interesting-- very interesting work. Maybe just also while we're on the subject of your recent papers, there's another bit of some of your research that's obviously super relevant, interesting these days, has to do with the potential distributional impacts of market-based mechanisms to control pollution.

And so as you're well aware, many economists favor regimes or instruments such as cap and trade programs or environmental taxes as a way of controlling pollution because it increases flexibility, leads to lower cost emissions reductions, and for various other reasons.

But there's been a consistent worry that these programs will lead to hotspots or will lead to increases in environmental disparities. Even if they're good at reducing pollution at low cost, maybe they push the pollution around in some way that makes things worse from a justice or distributional perspective.

So you've done some empirical work on that, and maybe we could just start with what is the theory for why it would be the case that market mechanisms would be worse than, say, command and control with respect to equity and then maybe talk about what some of your research findings have been.

DANAE HERNANDEZ CORTES: Yes, of course. So first of all, market-based instruments are not-- market-based instruments have been favored by economists for many years. And these types of instruments have the advantage that it can lower the cost of achieving an environmental objective, which is great from an efficiency standpoint.

But since markets are not prescriptive of where this pollution might be occurring, and where we will find these decreases in pollution, this same advantage that we see in terms of cost reduction could lead to environmental disparities by having this reallocation of pollution across space. And so the main question is what is the difference between markets and other more restrictive policies in terms of command and control policies that could be reducing this pollution as well from a more prescriptive manner, in terms of trying to have a more predictable outcome on the total pollution that is being emitted?

And so markets, you cannot see which facilities are going to be reallocating pollution, which would mean that there could be a concern in terms of environmental distribution, because some facilities might acquire more permits or might pollute more as a result of the market. And this, if it's correlated with where communities are located, then may lead to environmental justice concerns. And so this is the main question that is occurring.

And it's very relevant because several policies push the reallocation of pollution somewhere else, and could lead to these environmental inequality per se. And it could be very bad because in general, some of these policies are aimed at targeting pollution of one type. And there could be some unintended consequences in the pollution of another type.

And the carpentry program in California, which is the one that we're studying in the paper, was introduced in 2013. And in this program, main target was to reduce greenhouse gas emissions, which are a globally mixed pollutant, and thus is not subject to local pollution concerns. However, when these greenhouse gases are often co-emitted with local air pollutants, such as PM 2.5, NOx, or SOx-- therefore, this program, while altering where pollution from greenhouse gases is occurring, could also enter where the local air pollution disparities are going to be occurring because these local air pollutants are co-emitted with greenhouse gases.

So therefore, it can change the amount of emission, who is emitting them, and where they might be emitting. Therefore, having an environmental justice problem, which is that maybe those facilities that are emitting more greenhouse gases or not might also emit more local pollution, might lead to environmental justice concerns.

So there is some question whether that happened in the case of California. And what we find is that actually, the cap and trade program led to a decrease in the emissions of some of these pollutants, as well as greenhouse gases. And we find that disadvantaged communities, as defined by the California government, experience a larger benefit from those reductions. So we see California's disadvantaged communities actually being benefited by this program and reducing some of these environmental disparities.

**MIKE
LIVERMORE:**

Yeah, it's a really interesting finding. As you say, it's a really important issue. And it comes up. It's been a huge part of the discussion in California about the cap and trade system, whether it's a good thing and so on.

In a way, it's as you note. It's theoretically ambiguous. We don't know what's going to happen.

That's the whole idea in a sense with the markets. And you have to empirically tease it out. You can model it ahead of time, I guess.

But then you have to see whether those models are accurate or not. So it's a really big and important public policy finding that actually, it appears that cap and trade program has led to a reduction in disparities in exposure to these air pollutants of concern. So that's a huge important finding. And hopefully, it's getting the attention it deserves in California.

Is there a lesson here for future policy design? I mean, in part, because it's theoretically ambiguous and it just plays out the way it plays out, is there anything we should be thinking about for future efforts, given this relatively happy finding in California? But there's no guarantee that that's going to be the case the next spin of the wheel.

**DANAE
HERNANDEZ
CORTES:**

Of course, and I think that this is a great question. First of all, I would like to say that in the case of our paper, we restricted the facilities that we were examining. So some different facilities and a different composition than our sample could lead to different results, although we checked, compared to other samples' composition, and our results are robust. But that's something that I will always like to caveat.

But in general, I think that one thing that is important to understand about the contribution of this paper, and other policies in the future, is that this type of policy could have happened the other way around. It really depends on the characteristics of the downwind populations, and also the characteristics of the facilities. In our case, we saw that the facilities with the larger emissions were the ones decreasing pollution the most, which is consistent with this idea of if a carpentry program is targeting those that are polluting the most, then if those are the ones that are located close to these communities, then we might see improvement in this area.

So that is what we consistently find in this paper. And so this is important to consider in the case of other potential implementations that are similar to this. But in general, I think that it's important to really make it very clear that some environmental outcomes that are being targeted by a policy might not lead to the desired result for another outcome that it might be directly affecting. So in this case, the pollutant that was targeted by the program was greenhouse gases.

But we also have this other environmental issue, which is environmental disparities. And so whenever we are trying to reduce environmental disparities, we should also be aware that environmental justice problems need environmental justice policies. We cannot hope that any policy that affects the pollution of one facility may lead to environmental justice improvements. And that is something that is important to consider. So other policies that have to do with improving the outcomes of these communities are also important to consider.

**MIKE
LIVERMORE:**

Yeah, it's interesting. I mean part of, I think, the happy story again from your research is, when we reduce aggregate pollution, it actually often-- again, it doesn't necessarily have to lead to reductions in disparities. But it does seem to be the case that it often does, which isn't super surprising. I mean, if you cut particulate matter exposure by 90%, it would have to be really horribly distributed.

I mean, something really bad would have to be happening where that wouldn't also reduce disparities at some level. I mean, certainly, there's just a lot of interesting moving parts to that. If you, say, you cut exposure to some pollutant by 90%, and disparity doesn't change-- so you go from a situation where, say, you have two populations, less well-off and more well-off, and the more well-off people were being exposed to 50 units and the less well-off people were being exposed to 100 units, that's pretty bad disparity.

You cut that down from 50 to 5 for the wealthy people and from 100 to 10 for the less wealthy people, I mean, the disparity in a sense hasn't changed. But everybody is just so much better off in that kind of circumstance. I guess the question is, how should we think about that?

[LAUGHTER]

Should we be happy with that outcome? I mean, everyone in the less well-off community is much better off. They went from 100 to 10. They're also in the less well-off community way better off than the well-off people were before the policy because that's a change of 50 to 10. And so that seems like a very happy story.

But still, I think it wouldn't quite sit altogether because the policy was good in that it reduced everybody's exposures by a lot. But it didn't address this inequality problem. Yeah, how do you-- obviously, this is a purely normative question. It's nothing really empirical about it. But how do you think about the normative stakes of that kind of scenario happening?

**DANAE
HERNANDEZ
CORTES:**

Yeah, well this is a fantastic question. I think that what you're mentioning is really true. It's not only caring about how much exposure is being reduced in aggregate. But there's also a concern about the inequality per se and the resulting inequality at the [INAUDIBLE] of the policy.

And I think that there are other things happening at the same time. And I think that some other policies might have similar stories in this sense. There are some policies that might be reducing pollution more and other policies might not. And having these two alternatives is always it's hard, because in the case of our paper, and the case of many papers, you can only compare what happened to the policy before and after.

You cannot say what would have been a better policy that could have reduced more or that could have gotten rid of this inequality. So I think that is something that is limiting in that sense. A lot of these papers are all only able to compare the before and after. And so for us, looking at this reduction might be great. But we never know what is the potential for an alternative that could have happened in the background, so that is the first thing.

And the second thing is why is it-- I think it's also important, and we haven't mentioned in this discussion, partly because we haven't studied this. But what is the process to which we decide which policy is the one that we're implementing is also important. And I think that sometimes, there is one important fact there, which is are the communities liking that policy? Do they think that it's working? And so I think that is also another thing that could be happening there.

Now, in a normative sense, how do we feel about that? Well, first of all, I think that any improvement in environmental quality for these communities that have experienced all of these disparities in the past is good. But at the same time, what are we left with? Are we left with more or less inequality?

Well, that could also be an undesirable outcome per se. Maybe what we want is just to get rid of all inequality altogether. And so I think that that's also important to consider.

**MIKE
LIVERMORE:**

Yes, great. Yeah, and there's a lot of important stuff in there, including questions around process-- which of course, the environmental justice community has consistently emphasized. It's not just about results. It's about inclusion in the process. And maybe we could talk a little bit about that as well.

Yeah, maybe let's just focus on that for a second. So has there been research on that question? I mean, it's a little bit outside the standard set of questions that economists normally ask. Economists tend to be very outcomes-oriented, very consequentialist in their normative views and very outcomes-oriented in terms of the empirical questions that they study.

So is this something that environmental economists have asked about is process? And are there metrics for process? Are we interested in people's perceptions? Are we trying to develop some kind of objective notion of what kinds of processes are good? Where is the field on these questions?

DANAE
HERNANDEZ
CORTES: Yeah, so this question is more-- you're totally right that there's two questions happening here. One is what is the distributional outcome at the end. The other one is what is the process and what is the procedural justice, whether people are being considered or not?

And I think to that sense, there have been some papers that look at some of these issues. So for example, who is involved in the decision process? But in general, those tend to be very hard to answer. And there hasn't been a lot of this research.

There's a couple of papers that have shown that the process is important, definitely. But in a way that we can focus on an outcome of the process, I don't think there has been some papers looking at that. I could be wrong.

But it is also an important thing. And I think that in the paper where we analyze some of the literature, we leave it very clear that can be an important contribution for economists, which is how procedural justice and these differences in the access to the political process determine the total outcomes. It is one of the important questions to answer in the future.

MIKE
LIVERMORE: Yeah, of course, and that should make economists relatively more comfortable, because there's still an outcome orientation. It's still the question of how does the process affect the outcomes. There is an outcome-independent element of process as well. Even if the process leads to exactly some kind of benign dictator has the same outcome as a democratic and inclusive process, we might still favor that latter process, even entirely apart from effects on outcomes. But yeah, that's a hard question, I think, for economists to try to get at.

DANAE
HERNANDEZ
CORTES: Yes, and I think that there are some tools that we can get at in trying to again disentangle some of these causality questions. We have some tools for that. But it's in general a hard question to answer. I mean, that shouldn't restrict us, trying to focus on how we answer it. Maybe just having a description or on these different outcomes, and how different access to decision-making processes make a difference or not, could be just really good to describe these differences per se.

MIKE
LIVERMORE: Yeah, so maybe just returning a little bit to the themes that we were talking about earlier, which is the role of place in environmental justice and environmental inequality. It just strikes me as a really interesting feature of this work-- and really the way that inequality generally is tied to place, in a way, as you mentioned, it's true that the environment is very place-based. You don't take the air around with you.

But education is very place-based. Access to health care is very place-based. Personal security and policing is very place-based. And all of those different facets of life are very unequal in our society.

And so one possible response to this is, well, let's focus on places. Let's comprehensively improve school quality and improve environmental quality and improve access to health care. But then you run into this sorting problem, which goes by another word in many contexts, which is gentrification.

When you go in and you change how a place functions, often, that can lead to changes in the composition of the people who are there. Rents go up. Prices go up in general, and people sort around that.

So I'm just curious if you have thoughts about this in general as someone who studies these issues. I mean, obviously, it goes to the heart of how do we address environmental inequality, and inequality generally, if every time we orient ourselves towards these place-based improvements or place-based interventions, there's a sorting mechanism gentrification that happens. It seems like a bit of a treadmill that we could never get off. And I'm just curious if you have thoughts about what kind of policy instruments we might consider to deal with that.

**DANAE
HERNANDEZ
CORTES:**

Yeah, this is at the core of many of the current questions that people are facing, how those changes in the quality of an outcome might change the probability of people moving, sorting. And it is hard to answer per se what are the policies that could lead to this gentrification or not, because they are hard to be answered in general because you need a lot of detail on the people living there. You need to know where they are deciding to live over time.

You also need to be exposed to a shock that is particularly big enough that is changing the amenity. And that leads to this sorting. But in general, I think that it's important to understand the role of pollution per se, and whether that is incentivizing people to move, because then you can understand which policy might be better.

So for example, if you have a policy that is simply improving pollution, and people are restricted on where they can move or not then, it might not be desirable. Because if people ended up trying to move, then they are restricted of where they end up after moving. So I think there are a lot of interactions between different policies happening that we should be aware of.

Now, in general, gentrification has been linked to very big changes of pollution. So there's a very nice paper by Lala Ma and Elaine Hill and Alicia Cassidy that is looking at brownfield remediation, and how that did not change who was sorting [INAUDIBLE] where those places were being cleaned up. And the main reason was that, yes, it was a change in the environmental quality.

But it was not such a big change that there was this movement. So I think that it depends a lot on the policy. And I think for us to be able to find that this is actually affecting migration, we have to see a policy that is changing the environment a lot.

**MIKE
LIVERMORE:**

So we can improve the environment, but not too much.

[LAUGHTER]

**DANAE
HERNANDEZ
CORTES:**

Well, I think that is not a fair conclusion. But I think that it just leads to these other policies that are happening in tandem. Is it housing policy? Are people restricted because they don't have enough income to move?

Is it an income story? And again, all of these things are interlinked. But it is very hard to not think of them in tandem.

**MIKE
LIVERMORE:**

Yeah, complicated stuff, but obviously, really, really important. So maybe just changing tacks a little bit, there's what I think of as almost the inverse of concerns about the distribution of environmental quality, which is concerns about the distribution of the cost of improving environmental quality. So obviously, this plays a massive role in debates about any environmental measure that you could imagine. There's questions about not only the aggregate cost, but also the distribution of those costs.

Climate change would maybe be the clearest contemporary example, where there's concerns that if we implement serious carbon policy, that's going to lead to increased electricity prices, which is going to be regressive. There's geographic distribution. There's distributional issues around the economic sectors that are going to be affected by decarbonization.

So I guess one broad question is just, within the field, what are some of the-- and then there's these theoretical things that have been well-known for a long time. I don't if there's been progress in any empirical questions. But generally, the degree to which this is seen as the same research program, just about the distribution of regulatory costs and regulatory benefits in the environmental domain, or whether really, we see a bifurcation of the questions that people are interested in-- folks who are more focused on environmental quality and distributional issues there, and then to the extent that there are folks interested in the distribution of the cost of improving environmental quality.

DANAE
HERNANDEZ
CORTES: I think that they should be part of the same discussion. I don't think that they can be thought of in isolation. I think that they are mutually informative, especially because we're in a point where there has been these concerns about environmental justice. And they are important concerns.

And I think that in general, the cost of environmental policies are also important. So thinking them together is good, particularly in the context of climate change, because the costs are very heterogeneous and very unequally distributed across populations. And we should be aware of this distribution, while we also try to think about what are the costs of the policy per se.

MIKE
LIVERMORE: Yeah, of course, in the climate change context, there's also the intergenerational distribution of costs and benefits. And I wonder, as a scholar of environmental justice, is that something that you think is again under the same rubric sometimes? I mean, in some ways, obviously a lot of environmental questions have very long time horizons associated with them.

Even traditional environmental pollutants, not just greenhouse gases, it often takes a long time for a policy to be implemented. And the people who live in a community when the policy is adopted aren't necessarily the people who will be living there when the policy finally comes to fruition. Is that something that you think about, that you worry about? Or can we abstract away from that at some level, and think of the people of today representing this their same community [INAUDIBLE] there's a kind of a continuity in the communities, even if the people are turning over.

DANAE
HERNANDEZ
CORTES: Definitely, that's a very important generational component. And I think that this generational component is also linked to the present inequality, because as we have seen, the outcomes of the same generations that you had before affect your outcomes. And so thinking about the future, and the future outcomes of the generations that are to come, are not independent of what is happening right now, particularly in this distributional aspect. So if we continue to face these disparities in environmental outcomes, it's pretty sure that we will see them in the future as well.

MIKE
LIVERMORE: There's a self-perpetuating element to some of these inequalities.

DANAE Exactly.

HERNANDEZ

CORTES:

MIKE Yeah, so I think maybe this will be the final question I'll leave you with. This is a bigger picture question maybe, but it relates to the point you were just raising, which is maybe the self-perpetuating nature of some amount of inequality, including environmental inequality. Decisions that were made 50 or 100 years ago or longer-- like even over a very long time horizons, just perpetuate in some sense that the level of inequality, or at least some features of the inequality landscape, are not really the result of conscious decisions that are happening now-- certainly not decisions intentionally to perpetuate that inequality.

But they just occur as a consequence of, let's say, people investing in their kids' education. And people who have more money have more money to invest in their kids' education. And so their kids are going to be in a better position to attain in the education system, to earn higher incomes.

And when people are doing that, they're not intentionally trying to lock in or perpetuate inequality. But their behaviors certainly are doing that. I mean, it's very hard to see that that's not a consequence of those decisions.

So yeah, I'm just curious what you think normatively about that. Or is that just outside the research agenda? I mean, in some sense, this could be happening in the environmental context as well-- that there's this a locked in, or past even explicitly discriminatory practices, that just perpetuate forward in time, and will perpetuate forward indefinitely without some kind of intervention. Is there a way to identify those and separate those from where we're actively causing new inequality that wouldn't have been there, except for our decisions today?

DANAE Yeah, and I think that this is all very important. And I know that some of the consequences of the outcomes that we're seeing today are the result of some of the decisions in the past-- some of them intentional, some of them not. But what I can say is that in general, in the sense of environmental inequality, we are aware that some of the tools that we have used in the past have worked.

This means improvements in air quality generally tend to benefit the general population overall, but also sometimes, the places that are the most polluted, therefore reducing environmental disparities. So I think that the individual decisions that were made in the past have an impact now. And I think that that's even more of a reason why to create public policies that could benefit and reduce disparities in the future, because these decisions matter for the populations living there, and will have an impact in the future as well.

MIKE All right, well, thanks so much for the conversation. This has been a really interesting chat, and thanks for all of your incredibly important work in this area. These are all very, very vital questions. And they no doubt are going to continue to have a huge influence over our discussions of environmental policy for years to come.

DANAE Thank you so much for having me. This was great.

HERNANDEZ

CORTES:

MIKE And listeners, if you enjoyed this episode, let us know. You can give us like a rating, subscribe to the podcast, and follow us on social media. It'd be great to hear from you. Till next time.

[THEME MUSIC]

