[SQUEAKING]

[RUSTLING]

[CLICKING]

SIQI ZHENG: So, OK, so, today will be the last economics session before the midterm. After midterm, we still have three, but last three will be about finance, real estate finance for sustainable real estate. Today is about policy, and so basically, today, I will talk about policy how, at first, may not be possible for sustainable real estate. And then with the policy intervention, you will see that becomes possible, so we call it policy as a game changer.

So at first, maybe-- so I will give you this way to understand. So basically, remember, recall that, when in the introduction section, we put this three bottom lines, PPP, three bottom lines of the sustainable real estate. We mentioned that, of course, we are-- we want to do good things for the environment, so that's a reduced carbon emission and other things.

And then we also want to do good things for the people, society, for example, healthy buildings, for example, productivity, and happiness like that. And then we also from this classroom, we are real estate. So we are like private sector. We really need to do the profit.

So if no profit very hard, very hard to sustain. So we have the three bottom lines, then. Remember, when I first talked about this, they have-- they have intersection.

I said, OK, in the middle of the intersection, that's our solution because you can balance all three, PPP. But that's a dream. Sometimes it's a dream. It's very hard to get the intersection of the three bottom lines.

So then the market may not always work. Market may not always work. So we call them market failures. Then, if they're market failures, then we have three bubbles. We will diverge.

Then if you diverge-- so basically, then you have no intersection. If you want to go to planet, no profit. Go to people, no profit like that. So we already covered the two of the market failures. Today is the third one.

So a quick recap of the first two, information symmetry-- yesterday Akrisht already covered this. Information symmetry, so that means you have no information. You have no knowledge of green buildings benefit, cost. You have no information which building is a green building.

So then the developer just do green washing and then just sell you the fake green buildings. And then this market will collapse. So that's the first thing. Then that's why we need the certificate, LEED, Well-- all these certificates provide information.

Secondly is splitting incentive, so that one is about landlord versus tenant relationship, remember. And also yesterday covered in the presentation, split incentive means the tenants, if there is a triple net lease, then the landlord won't have the incentive to retrofit the building because they cannot recoup the benefit because the tenants pay the energy bills. And the tenants has-- also doesn't care about this building because the tenant's only in this building for five or 10 years. So that's cannot work.

Then a solution to this will be a green lease, a green lease to better arrange, to better share the responsibility and also share the benefit and cost of this energy efficiency. And today, we already talked two. Then, today, we'll cover the last one that makes these three bubbles diverge, which is the externality.

And do you understand the externality, at least the concept? So who already started or heard of the externality concept? Could you raise your hands? Who have already started this?

OK, good. So you have basic understanding. Then we know for the externality, first, we look at-- because there's two types, positive and negative. We first look at positive.

So think about this. This is the idea. So think about green buildings versus brown buildings. Remember, we always say apple-to-apple comparison. Then we have all as equal. One is green building. The other is brown building.

So green building is good. Green building will generate a lot of positive externality. So these words means this is something good. And the providers, they generate those things by developing a green building, but they cannot really get the benefit, the entire benefit of the green building because they generate a lot of benefits to the society instead of to this builder or this developer himself.

A very good example is the carbon emission, carbon emission. Climate warming is-- global warming is a global thing. Then all people are emitting CO2 to the atmosphere, then cause a global warming. And then green build is good because it reduce the carbon emission.

However, you contribute to the entire globe instead of yourself. So you cannot get all the benefit of this. You cannot say, oh, because I reduce carbon emission, then I get benefit of how many dollars. You cannot.

You just reduce the carbon emission. You will do good things for the society here. But this cannot get into your profit because there's no market, no very mature market for carbon. So this will be called positive externality.

So think about the balance. Remember, we have the balance [INAUDIBLE] benefit-cost analysis. So the point here is the following-- if you build a green building-- for example, your cost is like this big-- and then you do get some benefit back, like this is a benefit, for example, your energy bill will reduce because you will save energy like that. Your bills, energy bills, will reduce, and you will get some reputation, all the things good.

But you have one thing that you cannot get the monetary return, which your carbon emission-- this is carbon. You reduce the carbon, reduced carbon. So that's your-- this is your internal benefit. This is the external benefit you generated but you couldn't get into your monetary return.

So that's positive externality. So if you have this remember, then you will compare benefit and cost. You will say, OK, if I'm selfish, if I'm so selfish, I won't consider this because I cannot recoup this. I compare benefit and cost. Then I have so much cost and not so much benefit. I'm not going to do this.

So that will lead to an undersupply of this social beneficial goods to the society. And then the casing for the policy, why we say it's a policy game changer is to internalize. We really need the individuals, these decentralized decision makers as developers to internalize the benefit to society to themselves as money. And then they compare these two things.

They will say, OK, now I understand this benefit. I can really enjoy that I'm going to do this. So that's a thing of the externality this individual won't consider. Then the policy will move this external benefit to the internal private benefit that makes the market start to work. At first, the stock market won't work.

So that's the thing. If this positive, we always say this is a Pigouvian subsidy-- or anyway is a subsidy. It's an incentive. It's a good thing that you can get more benefit. And to incentivize these individuals, then in reality, there's many types of the subsidies, like tax rebates and subsidies, direct subsidy money and other-- not exactly they give you money, but will change to your financial return.

So if this thing, this thing, this product has positive externality, then the policy makers will have the responsibility if they want to move this external thing into internal benefit. They will give carrots. We call it carrots. So that's why I went to-- that's why I went to-- Whole Foods, and I got some carrots today. I went to Trader Joe, but I couldn't get. So that's why I have this.

So that's our carrots so that you remember this is carrots. And if this positive externality, we need to give carrots. The thing is the following. I want you understand the basic economics of carrots.

So, for example, now we are still thinking about green building. The green building will be positive thing. Then, however, unfortunately, first, before the carrots, no carrots. No carrots.

Then these demand sides, they only consider the private benefit, for example-- for example, it's good for reducing energy bills, et cetera. That's called private benefit. This is private benefit, only consider reducing energy bills.

However, there is another social benefit. Social benefit is reducing carbon emission. That's good for the society. But you cannot just change it to money.

And then if you are so selfishless-- you are socialist, you are selfishless, you consider the entire planet. Then the demand of the green buildings should be like this. This is the demand curve.

So you move up the demand curve because you consider the entire society. But not everyone's like that. It's very hard to expect all the individuals in the market to consider those selfishness. Then we need market. We need policy as a way to achieve this goal because this, at first, if you don't consider this, you have an undersupply of market equilibrium, lower quantity of the green buildings.

So actually, the social optimum point should be here. You should have more green buildings instead of this q prime. It's a q star. This is the optimal for the society. We need so much green buildings.

But, unfortunately, when people are relatively selfish, you only have q prime. And then we need to change. How can we reach that social optimal point is to give the carrots.

The carrots-- later I will show you other ways to move this to here. And for example, they will give a subsidy to households when they buy green buildings. That's one way.

But there is another way is to shift down the supply curve that also works. Anyway, our point is to reach this q, this optimal q. And then you should give subsidy to the suppliers. Think about the developers. The developers are so hesitant to supply green buildings because all the demand side, they are selfish. They don't want to pay. They have no willingness to pay.

Then we give them some bonus, like [INAUDIBLE] bonus. You can build taller buildings. Then you have more units to sell. Or if you build green buildings, the government gives you a tax credit or tax rebate. Anyway, that's the carrots. So that's the carrots so that, OK, we achieve. This now we achieve this with a game changer, so that's the idea of the carrots.

OK, another thing is now we think a bad thing. A bad thing may be a brown building. Or we can think about a factory, very dirty factory, always emit a lot of pollutants to the air. So that's a bad thing.

Now we think about bad thing. The bad thing is the following. This is a brown building. Now we think bad thing.

So the thing is think about this. At first, the developers, they don't care. I just build buildings. If I can sell out the buildings, I build a lot of buildings. I don't care the actual damage I create for the planet. My actual damage creates the negative thing, is more carbon emission.

Because you build a lot of brown buildings, you don't care. You build a lot of dirty buildings. Then you emit more carbon into the air, which was bad. But I think I'm selfish. I don't care. I will just build.

So at first, you only consider your private cost, which is your materials and all the things that you build. You say, OK, if people want to buy, I will just build. However, you have a much higher social cost because you build a lot of dirty buildings. You emit a lot. Actually, your costs should be higher if you consider the planet.

So now, the thing is, if you don't consider-- you are selfish, you build a lot of brown buildings. But if you-- selfishless, you should build less because you have a higher social cost. So that will Q star here.

But, however, only with the market, it is very hard. It's very hard to achieve this because everyone just wants to make profit. So we need a market changer. That's we call sticks. Then I have a sticks not from Trader Joe but just from our yard.

So this [INAUDIBLE]. So this is a stick. So stick means, OK, you are doing bad things. I must let you burden-- put the burden on you so that you will not do that. So that's a tax, carbon tax.

OK, OK. You are selfish. You don't consider the things you hurt, the environment. Now, I'm moving up artificially. I charge tax to you.

If you do things, you will pay carbon tax or penalty, like Local Law 97 like this. So that is a stick. Immediately move up the cost. Then they will build less of the brown buildings, or they will take action to retrofit their brown buildings into green buildings.

So that's basically today's point is this, and this one is small. This is very big. But anyway, so this is the carrot and sticks. Any questions until now? OK.

This is very abstract. That's why I put it here. But later, I will give more examples of the carrots and sticks. And later this is our common language in the classroom between us. After you graduate and then we say reunion, we will talk about carrots and sticks.

You will tell me-- in your market, if you later become developer, you will tell me whether you think you have enough carrots or too much sticks because we are developers, too, remember. We are-- maybe some of you will become policymakers. If you are policymakers, you will need to design this kind of thing.

It's too big. Then you'll kill the market. Nobody wants to do things too big. Then I say, oh, cut, cut, cut to the extent that you can still make the market work, but you want to achieve this q.

Or you say, OK, this carrot is too small. Then I have this, too small. Nobody want to do. Then I add on incentives to get more carrots.

So later, when you work, when you go to work, if you're policy makers, you design the size of this and the size of this. And if you are developers, no problem. You can complain. It's too much, too little. And then you can lobby the policy makers. That's how this works.

So then this is a table. Yesterday I previewed this table. That's our boxes, four boxes, four baskets of the carrots and sticks. So we have the sticks. The formal name is enforcement. And the carrots, the formal name is incentive. And then we also have the mitigation-adaptation side so that you have a better understanding of this.

So think about we talked climate. This climate is very, very good example of the negative externality, or you reduce carbon [INAUDIBLE], so we use mitigation. Mitigation means we will reduce your carbon emission, like decarbonizing buildings, P set number one. P set one is about mitigation, how you retrofit your building and then you reduce carbon.

Then the government says, OK, I understand. You are very hesitant to do so, and you resist. For example, Boston Properties, they don't want to do anything. And then they impose sticks and carrots.

Another thing, P set 2, remember our hedonic regression. I know tomorrow is a due date. Today or tomorrow is a due date. So that is to understand adaptation.

So you understand, OK, if we have houses, buildings in the flood zone, bad. And then later we'll get flooded. So we need to take action to adapt to that. Then you have sticks and carrots.

So that's-- and the building codes is in the middle. You have building codes. You can say, OK, the building codes say you're building energy level must reach what? That's a building code.

Then that's mitigation. Adaptation, if you are in a flood zone, you must elevate your ground floor to high level. So that's also building code. Building code is like minimum. It's like, you must achieve this. So that can be used, mitigation, adaptation, both.

OK, so now I'm doing this. So first, look at carrots. So we look at carrots. You will find that green building policy, so many green building policies in different cities. So from the states, from the countries, from country, from the federal level to the state level to the county level to the municipality level, so many policies. And you see so many, and different states have different things.

That's a way. This is a policy monitor. Green buildings, economic policies. And I think our TA Sanjana is now doing a policy tracker. It's similar idea because policies, these two different types of carrots or sticks, is totally different. And they are narratives. It's very hard to quantify.

So Sanjana is now doing a project as a policy tracker of this building, decarbonization and different local municipalities and even different countries and to measure that policy. So that's the idea. Now, carrot number one, carrot number one, any questions here? Why are you so happy?

I don't think you need this. And if you answer questions, well, I will give you this.

[LAUGHTER]

But I don't think you need this. OK, question?

AUDIENCE: Yeah, look, I just think it's-- the concept is simple of the economics and where to set the [INAUDIBLE], how do you get the social [INAUDIBLE] a lot of costs for--

SIQI ZHENG: You mean it's very hard to achieve that social--

AUDIENCE: Yeah.

SIQI ZHENG: --optimal point?

AUDIENCE: How do you define the social optimum?

SIQI ZHENG: We can define that theoretical way, but, in reality, it's very hard. We understand-- we always we-- I think, for economists, they understand which one is which, like social should be higher or lower than the market equilibrium. That's quantitative way.

But you calculate the-- Exactly the number here is very hard. And also sometimes the policymakers, they are not so smart. They understand this. They design policy.

But the problem is-- let me see. For example, they design the policy. But the problem is they estimate. They estimate some sophisticated models, but they make a lot of assumptions.

And people's behavioral response to those policies may not be the same as these policymakers. So then we call it the unintended consequences. You impose a policy, and you assume that people will respond. And actually people will not respond in that way. Then you have other side effects of the policy.

But in theory, there should be a social optimum if you really can capture and estimate all the social cost. Now, I started from this, this carrot. This is a big thing. I don't know why the EU is so rich. I feel EU is very rich. So I really want to move to the Europe.

So the point is they are very rich. And then they have a lot of money, and then they commit to endow this amount of money, 672 billion money. The European Council agreed. Use this money and to subsidize the building renovations.

So they call it the renovation wave. They have ambitious goal, say, 2030, all renovated. And then if you decide to renovate your buildings, you apply for funding. Then the EU will give you funding.

So that's a big, big carrot. I don't think the US has this. Maybe US in some area has, but it's very, very big thing now in EU that, if you retrofit, then you get money from the EU. And then this is-- the good thing is the following.

This is EU money. This is all you get. And then, because of this, the private sector, like the banks and some financial institutions, add on. So then they said, OK, if you go to the EU, get money, then we will match with some private financial tools. Then you have more money, so that's a good thing.

OK, now we move on to another carrot. It's a another carrots. So that's from Massachusetts. So here, so Massachusetts, basically, if you go to the Mass Save website, you will see if you're residential, if you are homeowner, or you are small business or big business no matter what, and then if you are non-profit like that. You hit on these things. You will find many, many small-, and big-, and medium-sized carrots like that.

And we already mentioned this example. This is a heat pump, heat pump installation, for the heat pump because, thanks to Biden's Inflation Reduction Act, then you can have more. There's a subsidy if you install a heat pump. So question. I'm not sure many of-- I'm not sure how many of you are home owners or tenants or you already used this. Anyone? I know you have used. OK.

AUDIENCE: I'm a renter, but I used [INAUDIBLE] to do some energy efficiency around my house, which was [INAUDIBLE], free. So they gave me free light bulbs and changed out my thermometers [INAUDIBLE] smart thermometer, gave me new showerheads and stuff.

SIQI ZHENG: Yeah, you first did a energy audit, and they will do an energy audit and say, oh, this building is so old. And you need to change this, change this, and change the insulation, and then you-- OK, how much money you got and whether you are happy with that?

AUDIENCE: They just give you a bunch of free stuff. [LAUGHS]

SIQI ZHENG: Yes, OK. All free. So you don't need to spend money. They will come and give you things.

OK see, this is good. And even this is not only for homeowners. It's tenants also eligible. Who else?

Now we only have two people in this room, so this is for you. [LAUGHTER] Free stuff. OK, good. Who else? Who else? No, nobody.

OK, we need to learn more. So we need educate more. Actually, we are doing a research project now on this. After today's class, I'm going to go to the MIT Energy Initiative to present our work is actually exactly this.

That's our ongoing work, ongoing research. Again, if you are interested, talk to me. It's the following.

We know that, for Massachusetts, there is a heat pump, like $10,000. You can get subsidy, carrot. But the installation, the adoption rate is still very low. We want to understand the puzzle of this. Oh, free money, but why still installation? How can we accelerate, accelerate this?

We may need more carrots. So that's another more. So the thing is, sometimes you cannot just give money, but you need some mechanism. For this thing, we found out actually, this $10,000 is enough to cover this machine, but it's not enough to cover all the installation.

You have workers. You have all the things. Then it's not enough. And then the people, they don't understand. People come, and people they don't understand knowledge. So these are education information, all the things.

OK, let's think about carrots. So just now I mentioned this. So game changer, this conceptual-level pro forma, conceptual-level cash flow diagram is so important. So at first, the green retrofit won't work. The green retrofit is too expensive.

Like Prudential Center, for example, too dirty building. Then if you want to retrofit, a huge investment is needed to do the deep retrofit. And then nobody wants to do.

Now the game changer comes, say, OK, we will get subsidy. So then we will offset this upfront cost. So that's very clear. So then this might decrease because, remember, NPV, NPV, NPV is our decision making tool.

NPV must be positive. Otherwise, it doesn't make sense. And at first, this upfront cost is so big, and this is totally negative. And then because of Mass Save or some other, like EU, then they give you subsidy. This one becomes smaller then this change NPV from negative to positive.

So that's why we call it game changer. At first, NPV negative and now become NPV positive. At first, negative because too big. Then, because of policy, thanks to the carrot, then positive.

And it's not like only give you a-- write a check to you. Or if you install this, write check. If you do this, write a check. Sometimes it's not a check, per se, but it will really help financial, very big financial benefit.

So that's another carrot, which is the density bonus. The density bonus, I think that's very easy to understand. So basically they say, if you build a green building, they have a standard, for example, LEED. They always need a standard. You cannot just a self-report, say I'm a green building,

For example, this is Arlington, not our Arlington, Arlington, Virginia. Then here, here, here. And LEED version silver, gold, platinum, if you really meet the LEED Silver, you get a certificate. Then you can get a bonus of 0.05 increase of the FAR.

So all other buildings, 0.25 FAR. That is the cap. Now they lift the cap higher. Then you get more.

So I think that's a-- let me see. Yes, so that's a casing. Oh, so, so sorry.

They have a benchmark FAR. If you are silver, you get this increase. This is incremental. And then if you meet other priorities, I think you get another 0.05. So always you get these.

For Silver, you get 25, 0.25 FAR increase. And the gold, 0.35, and the platinum, 0.50. So that's a big carrot. So this is not a check, but you can build more, which is so important, You can build more.

And I remember. So question for this-- if you are policymaker, if you are in the building authority of this Arlington town. And when you design this, when you later go to the town, city government, like carrots, carrot's role in the city hall. So how you are going to design?

Do you think these numbers, they have a very scientific calculation or something? Why did they came up with these numbers, 0.25, 035, 0.50? Do you know this is very scientific based?

AUDIENCE: I don't know if it's scientific based or not, but it probably should be because, if you're going to be increasing the FAR, it's going to use more energy. It's more space to heat and cool, and things like that, and electricity usage. So you want to make sure that you're getting the benefit of them switching to LEED and things like that and getting a benefit where there's less consumption.

SIQI ZHENG: Very good. So if you are city policymaker, where are you on your mind when you decide on this? You understand? This, the developer, they don't want to build.

AUDIENCE: I just wanted to add that also the embodied carbon would increase because you're building more.

SIQI ZHENG: Yeah, that's exactly. Yes. Yes, embodied operational carbon will both increase if you build taller. And other things? Please.

AUDIENCE: You encourage the developer to build the green building.

SIQI ZHENG: Yeah, that's the purpose. But how you can really decide on precisely that number to give them as a gift. This gift to you, please.

AUDIENCE: [INAUDIBLE] signs Billy was talking about, you also have to think about the financial cost. So what's the cost of your additional building systems to hit these hurdles versus the FAR that you're granting? You got to grant enough FAR more to subsidize the cost of the added scale of your scope.

SIQI ZHENG: OK, good. But [INAUDIBLE] you are from developer's perspective, right? No, I'm talking from the city's perspective, whether they are giving too much or they are giving little. [INAUDIBLE].

AUDIENCE: Understand what that cost is.

SIQI ZHENG: OK yes.

AUDIENCE: [INAUDIBLE]

SIQI ZHENG: They need to understand whether the developer will respond or not. And for the city perspective, more from city perspective? Yeah, please.

AUDIENCE: I think from the other side, if you look at it and say if you're jumping from 0.25 FAR to 0.50 in an office building, you're creating twice as much supply of office [? Platinum. ?] And that would, in theory, not be created somewhere else because you're already creating it in that place. So like--

SIQI ZHENG: You will-- it'll create more supply. Maybe the rent will go down, are you saying?

AUDIENCE: The supply is limited in the city for office. You can't build whatever you want. So if you're already turning the 0.25 in that building into a 0.50, you're reducing, what another developer [INAUDIBLE].

SIQI ZHENG: OK. good, so very good. So that gives you a sense of it's not that easy, actually. I think just now someone asked a question. It's not that easy to really design the optimal policy, optimal size of the carrot. It's very hard.

And you need to consider both sides of the coin. First, as many of you said, you need to understand, is this enough? And whether this will really nudge the developers to respond in a way you want them to respond. Maybe too little, no response, and then you have some other things.

If you increase the height, then you have carbon emission, like negative things. And for this FAR itself, on the other side, you need to see the social-- this is like, oh, if you do this, the social benefit, that's the rationale. But you also have social costs related to this.

Why the fundamental rationale of FAR limitation of zoning is you cannot build too much? If you build too much, you add a lot of burden to the city's system infrastructure, for example, traffic, all the tall buildings, and traffic, and all the things, and all these infrastructure system. So when we design this, from the city, from the city mayor, and to balance the social benefit of this, the social cost of this because I'm the city mayor.

The social benefit will be more green buildings. The social cost will be taller, buildings, more embodied carbon and operational energy use, and more traffic around that area, and this and that. So that's the point.

And this density bonus is a carrot. So the point is it's not a check, per se. But it will increase your revenue for sure because you build more. Then you have more office space to rent out.

So that will change. That will change the thing of this equation, make NPV negative to positive. Then they respond if your if your carrot is big enough.

So here is very interesting is our project we have been doing for one more than one years together with Zhengzhen, Akrisht, and other another professor Justin Steil in our department is a combination. This one is very interesting.

The story is the following. There is-- this is a real project. We have a project that this Massachusetts Association of Homebuilders, HBRA. So every state has some similar association of the builders, especially the medium-sized and small-sized builders.

They want to have a market power. They want to say-- they want to talk to the governor of the state. So they just gather together. They have this association.

And then the Massachusetts, very, very aggressive-- very, very, very, very progressive. Yes, so basically, they said, they want to reduce-- they want to change the energy code. Energy code is a stick, remember? Energy code is a stick.

So they say net zero. The governor said, we really want to achieve net zero very fast. Very fast trajectory, go to net zero.

They have an energy index called HERS, HERS energy score. Every building has a HERS. I'm not sure whether when you get the energy audit. They will tell you the HERS score of your building.

And then they say, OK, now I mandate. I mandate all the new constructions, new buildings. Energy HERS score must decrease from 55 to 45 or 42. That's a big decrease.

If you decrease to very low, then you become net zero. Now they are doing this step by step. At first, may be not net zero, but they want sharp decrease of the energy score of all the new construction of the housing units in Massachusetts. And then these homebuilders, they are very anxious, and they are unhappy.

They are saying, why? You cannot just think about this political goal of the net zero or to society, to the planet. But you need to think about our cost because then it means must fully electrify, heat pump first, and the installation and the passive house. That all means costs increase.

Then they say, OK, costs increase. We cannot do. You cannot just give a stick, and then you ask us to do as a mandate. And we will not do. If they will not do, that become a problem. Why? Because, especially in Boston area, as you know, it's already limited housing supply.

We don't have enough houses, especially for some areas with a lot of people, not enough, not enough houses. Then if the builders all get upset and they all step back-- so we're not going to develop new houses-- that will be a shortage of the supply. That will push up the housing affordability problem, no supply.

Or they say, OK, we will supply. But since you only give us stick, you give us stick now, we are going to pass on this cost into the buyers or the tenants. We're not going to carry on this cost. If this induce or increase cost of 5%, we will go to the price, say 5% higher because we have power because it's still limited housing supply.

So then that will hurt the house affordability. Then they came to us saying, although we have this intuition, but we don't know how to talk to governor. Governor want us to show empirical evidence. We need empirical evidence, evidence-based, so that we can talk to governor.

So they came to us, all of us. And they say, OK, MIT, could you do a project? Could you do research to quantify, if you go in this way, what will be the actual burden to the households in terms of the housing affordability? So that became our project called "The Balance Between Sustainability and Affordability."

You cannot everyday say, oh, sustainability is so good. So we all go to green and net zero. But you need to think about affordability. Remember ESG? So we talked about this, ESG.

Now everything benefits all three. Now, if you think, oh, we only consider E, then you heard, so go up. Social part go down. Housing affordability is a social thing. If this go up, this goes down.

How to balance-- how to balance these two? That's the question. So you need to design a good policy to balance. Then we start this project.

We are almost done. We will go to Washington DC early June to present. I think that will be a National Association of Home Builders-- National Association of Home Builders, NAHB, yes. Massachusetts, because the governor is so progressive-- so we are going to go this, and there's many, many states.

Some are relatively not that progressive. Some are progressive. We are going to present our research to let those policy makers understand this. Then we did analysis of housing affordability.

For example, we understand housing affordability is a share of the housing cost and household income. Have anyone have studied this housing affordability thing? Do you know there's a threshold?

If the share is above a threshold, that's not affordable. And then you are eligible for some subsidy or some program from the government. Do you know that threshold?

AUDIENCE: 30%.

SIQI ZHENG: Yes, 30%. I think you have this mixed income housing project class, 30%. This thing is a share of this. If this about 30%, not affordable. And then the housing costs can break down into this is a utility bill, of course, the housing cost.

And another thing, the home owners will be the monthly payment, like the mortgage, and the tax, and insurance. If the renters will be rent, and both renters and owners need to pay energy bill.

So then we say, OK, if we go to net zero, this one will decrease. Then this one will increase. But to what extent? What should be the elasticity of this?

For many of you, you may understand this is a big thing. This is a majority of the thing. This may be a small thing, minor thing. But this one will decrease, and this one will increase if the developers pass on the cost to buyers and tenants.

Then which one will dominant? And in which market will dominant? And to what kind of income group will dominant? That's totally empirical.

Then we started. We get data. Of course, this research needs data. So we have data. This is Massachusetts. We got data from all households, of the single family, of multifamily.

Then we have income groups from the very poor to very rich. I think we have 20 groups, 20 income groups. And then we started this. I think this is an energy bills. This is an energy cost, energy bill cost.

And then they have some insurance and tax cost. Then they have their mortgage income costs like that. And then the solid line for each category is before the change. The dashed line is after the change.

So you will see, yes, your costs decrease but so little, invisible, almost. So little change. However, the price may go up. So the dashed line is above. So then this is the 30% line.

So you will see, of course, the poor people always affordable, no matter what, always affordable. They always need subsidy from the government. They are always very high because their income is so low.

But the change will hurt those groups, see? This is group that will be hurt by this sustainability because, at first, they will be below 30%. Then, after the change, they jump above 30%.

So we identify, oh, this group will be very vulnerable and from OK to not OK. So this is multifamily, multifamily, every income relatively lower. OK, that's the point. So then we give suggestions. Question?

AUDIENCE: Oh.

SIQI ZHENG: You want another carrot? Go ahead.

AUDIENCE: I was just curious how the Homebuilders Association feels about these findings, because they're the ones that wanted you to do this?

SIQI ZHENG: Yeah, yeah. So, yes, they want to-- they want-- we will go there. We will go to DC to show this to-- this is Massachusetts, but we will show to other states.

So they want this. They want to show. So this will hurt because their argument from the beginning is you cannot just do stick. You need to couple with a carrot.

If you couple with a carrot, you will reduce this part because then you give some subsidy or what kind of things, carrots to the developers so they won't pass on so much to the buyers and the tenants. So that's [INAUDIBLE] combine, cannot do this, only this.

So that's the thing. And then, however, this is politics. As last time, remember, Ed Golding come-- came, last session. He says, sometimes it's not just a social issues. It's just the equity issues. Instead, money is about politics.

The politics will be very pushback from the policy makers pushback. If you say, oh, write a check. If you do this, write a check to developers. Very hard.

So they may be more acceptable, amenable to some ways of FAR, this kind of things, increase a little bit FAR as a FAR bonus and do some tax rebate and some expedited permitting process. Others, like two years, you get a permit. No, then you [INAUDIBLE] the permitting process.

So that's some kind of-- so zoning will be the best solution, we feel, zoning because zoning will make sure they really start to build. If you don't build, then you cannot get the benefit.

OK, now I need to move on for other sticks, other sticks, this stick is-- I think many of us, we went to the New York city field trip with Kairos' class. I was also there.

We went to some buildings, and in every building, I tried to find this. I tried to find this. And remember, I also ask a question when we first stop at the Rockefeller Center. And then, because New York city said, you must put this very, very entrance, the entrance of your building, to show this is mandate. You must show your energy reading.

A good, B, C, D. So this is mandatory to put. That will pressure. If you are too dirty, you have D.

Then, when we were there together with Kairos, every building I try to find-- in the last building, the last of the architect building, the architect firm visited, finally we found a D, a very corner place, "not very easy to see" place. In another building in my hotel, I went there in Thursday night.

And the Thursday night, also a D here and also behind a door, a place they posted there because they have to post. But they feel so embarrassed and to post a D. If they are A, of course, they put here. This one is very-- this one is very brave, and they put C there. But this is a stick, make you lose face.

AUDIENCE: How do they get LEED Gold if they have such bad energy?

SIQI ZHENG: That's a good question. I don't know. [LAUGHS] Check this building.

OK, so I think New York is very, very strict, even LEED, not good. C. Yeah. So we have similar things.

Boston has BERDO, and the Cambridge is BEUDO. Very similar pronunciation, but they are different. So this is MIT. This is Cambridge because we are in Cambridge. Cambridge also has this, lose face, so disclosure mandatory.

So they say Cambridge is a BEUDO. BEUDO [? set, ?] it's very similar, Cambridge version of Local Law 97, the disclosure. You must disclose your energy.

So this is our building now. We are here, building 9 Total carbon emission intensity is 22.15. It's very small.

And this one is a Hayden library. Have you been there, the Hayden library? Very beautiful, the renovation. They did the renovation in 2020, 2021 during the pandemic, and then they finished the renovation.

I strongly suggest you go there. I always went there when I feel stressed out. I go there, and I stay there. And I look at the Charles River. I. feel good.

So this is a very good library, the first floor, 24/7. All the time you can go there to study.

So LEED Gold, Fitwel, all the good things they have. And then they have all the things as a role model on campus for the green and healthy building. And we already talked about this.

SEC push that you'll use this for your P set 1. They push for all the listed companies, big companies to disclose, scope 1, 2, 3. That's it.

So then this minimum energy efficiency. This is not a stick. It's a huge stick. It's very, very thick stick, very strong stick in UK.

The UK said it's not like only ask you to lose face. No, not just losing face but real action. If your energy standard so low, so dirty, you have-- you cannot lease, can no longer lease your properties until you make the renovation, makes the energy rating better. So if you-- since this, since this 2020, below E, bad.

Stop losing, out of the market. Andy.

AUDIENCE: Is there an enormous subsidy that goes along with this? Because otherwise you're just punishing all the renters in the marketplace.

SIQI ZHENG: Yeah, that's a good question. We need to check out. I don't know. I think they should have some carrots combined.

AUDIENCE: Because if you just said all landlords [INAUDIBLE] poor quality apartment, you can't rent it, all the prices in the market just went up.

SIQI ZHENG: Right, right, right. So it's very thick, correct? You must have a small carrot together so that you can balance.

And then otherwise, all the out-- all the-- No, no, no, that's very similar to Massachusetts.

So the casing is very strict. If you under-- no rent. Then rent is gone, no revenue, no revenue. So that means it become a game changer.

Then you say, OK, I have no other choice. If I still want to be the landlord, I have to do this renovation to get out of this situation and get above E. So that's not a losing face, saying this is really cut, totally cut your revenue. Cut your cash flow.

OK, now, Local Law 97 is a big stick. We already talked so much. I'm going to skip this. Skip this.

And remember, another thing I really want to tell you is the following. Until now, I give you some examples of sticks and carrots. So you will find out very interesting thing is the government is not so stupid.

When they look at the big developers, big real estate owners, commercial real estate, they use this because they are rich. They are on Wall Street. They are the rich people. They are all they want to charge them, so use these sticks.

For households, they use this because, for common households, they use carrots. Oh, can you do this? Can you do this? If you do this, we will get a check. If you do that, we will give you a check.

So that's the thing is too big guys, Local Law 97, stick, because they are rich, and they are easy to target. And for household, especially middle- and low-income households, they do this because, otherwise, you will hurt this social thing. So that's always we find.

Boston called BERDO, that's the same thing. I want to say that Boston is more aggressive than Local Law 97, BERDO. Although all the Local Law 97 is very famous, but you can see Boston, 2050, 0, 0, 0, 0, so which means, really, [? neither ?] 2050 for Boston. But Local Law 97 is not that case. I think local 97, even they are not so aggressive, to see all zero in 2050.

Then we have BERDO, right? Big guys, big guys, sticks, money, fine. Then penalty changes the game, game changer here. If you don't do anything, big penalty. So at first, they may not want to do now, game changed.

Cambridge, BEUDO, similar pronunciation. BEUDO, Building Energy Use Disclosure Ordinance, same thing. But the difference is the following.

I feel this is very interesting. I don't know the logic. I hope you can help me find out what's the reason.

For Local Law 97, they have the real thing of the cap. For Boston BERDO also cap. This is absolute numbers of the CO2 emission.

But for BEUDO, no, relative term, relative term. They use 2018 to 2019 as a baseline. That's a baseline. No matter what, building's very green or very dirty, no matter what, look at your own building, yourself, '18 and '19 as a baseline.

Then you start to reduce 2025, 80% of your baseline, your own baseline, then [? 72 ?] [? 0. ?] 2035, 0, more aggressive than Boston. So the aggressive index will be-- our own Cambridge, we are so proud. We rank number one, top, and then Boston. Yeah, please.

AUDIENCE: [INAUDIBLE] using this method, wouldn't it be unfair for [INAUDIBLE]?

SIQI ZHENG: Before that? Before or after?

AUDIENCE: [INAUDIBLE]

SIQI ZHENG: Yeah. Then what will happen? So unlucky. If you ran away before, then your benchmark is already very, very clean. Then you continue to reduce.

This is a very good point. Do you think our building is lucky or unlucky? This is for you. This is a very good point because that's what our next slide-- do you have a question?

AUDIENCE: Yeah, I also have a question. What's the square footage requirement on this? Because I think Boston was 20,000, right?

SIQI ZHENG: Yes. This one also big, but exactly saying, I couldn't remember. But we can check. Also, big buildings, not like single family.

So now you see Cambridge. If you-- unfortunately, you are in Cambridge like us, 2035, net zero. If you are in Boston, 2050, net zero. If you are in New York city, not net zero.

Then look at MIT. Although MIT, we are like a non-profit organization, we are not like a for-profit organization. We are also subjected to this regulation.

That makes MIT-- MIT has a sustainability office. I'm a good friend of them. They have a sustainability office. Julie, Julie Newman is the head, also lecturer here in DUSP. And they are so busy because of this. Carlos.

AUDIENCE: I have a question [INAUDIBLE] with the last slide. Have you done or Cambridge, policymakers, whatever, that did maybe study before doing this BEUDO law of the financing stage of all office, all assets, all real estate assets located in Cambridge that could be affected on refinancing with the banks, given this--

SIQI ZHENG: Very aggressive, yeah.

AUDIENCE: Because old buildings will most likely won't achieve this, and they will be the most likely-- maybe if they have to refinance in 2032, they won't get refinance under a normal and fair rate, which will lead to defaults, very high rate, I imagine, no?

SIQI ZHENG: I don't think they have really done a very thorough research. That's my-- because this is too rushed to put on this. But the good thing is this has not been written into the law. This is almost there.

But I think Boston is already implemented, and they have to do. This one is in the final discussion thing. But I think they will pass in some other version. But I don't think they-- because they met a lot of pushback about this. So now I'm going to say that--

AUDIENCE: Sorry, just following up on that, don't you think that policy is also going to make affordable housing more expensive? And--

SIQI ZHENG: I think they target the big buildings. But if these apartments, yeah, yeah.

AUDIENCE: You're targeting old buildings and buildings that cannot really afford to become net zero. So It'll affect the low-income renters, but it will benefit whoever can pay for the [INAUDIBLE].

SIQI ZHENG: Yeah. It's like big apartments, like that buildings, that will be in this category. And maybe this also like median income and all the people, they have to pay much higher rent because they have to achieve this. This is-- I feel this we don't understand this, actually.

And I went to our MIT sustainability office. They also have a class to make a presentation. And they were all complaining about this because this make MIT sustainability people cannot sleep, cannot sleep at all.

Then MIT's even more aggressive. OK, MIT, of course, we need to show our commitment to the climate crisis. So we have a committee called 2026 Net Zero, MIT 2026 Net Zero Committee. On that committee, we have a bunch of professors in that committee to help MIT how to achieve this.

Now, our only way to achieve this is to buy credit, carbon credit offset because you cannot eliminate overnight to make all the MIT buildings into net zero. That's no chance for 2026, only three years from now. How can we?

And the only way for short term is to buy carbon offsets. But since we are MIT, we must study carbon offset market very carefully and buy very credible offsets instead of random offsets because there's a lot of critics on offsets.

So then our goal is 2026 no matter what. We must achieve net zero even by buying carbon offsets. By 2050, MIT campus will be real net zero, so that's the goal.

Look at these two buildings. One is building 9. The other is Hayden Library. Just now, you raise a very good point about renovation. Unfortunately, this building is so unlucky. This building was renovated in 2015 or 2016, already renovated OK, great.

Before I came to MIT, got renovated. That's why we put Sam Tak Lee building our last name because Sam Tak Lee's a donor, gave some money. Then we renovated the building.

And again, renovated the building, now it's very stable because already renovated. Then Hayden Library, at first, this is carbon, right? 14,, now 5. This was renovated 2020. So this is relatively lucky, this building, because renovated after the baseline year. This renovated before the baseline year.

So according to this thing, Building 9, you need to do a lot because Building 9 is 2018, 2019, already after the renovation. Then you need to continue to make our building greener and greener and greener to reduce.

And then for Hayden Library. This one was very high because it ran out later. Then they are less under pressure. Then we, ourselves, we calculate this potential penalty for this building and the Hayden Library. And we use this to show to the MIT sustainability office, say, if this got passed finally by the Cambridge, see, then, Building 9, immediately pay penalty, Building 9.

Pay until 2050-- 2035. Then you are flat because always net zero. And Hayden Library, at first safe. And then at some year, start to pay penalty.

So that's the thing is this is a non-profit organization. It's not like Building 9 then our department and me at the Center for Real Estate, we need to pay. We don't need-- for us, we don't need to worry. The MIT president will need to worry about this and how to pay.

Then MIT said, OK, now we want to buy offset. The good thing is, although they are so aggressive but they still have a condition [INAUDIBLE] reasonable, say, maybe they will accept offsets. So if you buy offsets, then you reduce your nominal carbon intensity. Then you can avoid penalty because, if you ask people to buy offsets and then you still ask them to pay penalties, that's unfair.

You buy offset. You spend money. And then you still pay a penalty. How can-- then everyone needs to pay penalty.

So if-- this is a BEUDO cap, da da da, like this. And then this is MIT by offset. If MIT buy offset, zero, no penalty, safe because offset. If built or later set, no offset accepted.

Then, at this moment, MIT need to pay a penalty. So that's the point, OK. [? Jiane. ?]

AUDIENCE: [INAUDIBLE] for the offsets [INAUDIBLE]?

SIQI ZHENG: This is a messy market.

AUDIENCE: Somewhere between $2 to $500 [INAUDIBLE] the topic of [INAUDIBLE] $2 to $500. So right now, you can check the carbon credit online. And I think it's like hovering around 2 to 3, but in European, there's some high quality.

SIQI ZHENG: So the carbon offset market now is very messy because there's no very clear regulation of that. And then you just plant some plants. You plant some wood, trees. Then you can sell your carbon offset to others. Then there's a lot of questions regarding the credibility of the carbon offset.

So MIT we have so many professors who are studying carbon offset market. So we have this committee to make sure that we are going to buy the good offsets instead of the fake ones. But the entire market is very messy.

AUDIENCE: What does Cambridge propose they're going to do with the money from the fine? Are they going to set up like a climate fund or something? What are they going to do with all that money?

SIQI ZHENG: I have no answer. Yeah, that's a very good point. So maybe, yes, I think this money is charged from the buildings. They must need this to address the climate crisis. So I don't know the answer. I think they will consider to use that for some subsidy to the building retrofit or something.

OK, the final stick will be energy codes. So I already talked about this. You know this energy code thing. And then energy code is enrollment over time.

At first, this is a use-- this is New York City. So they have different versions of the energy codes, and then they become more and more stringent. And they use that to address the mitigation and adaptation.

So overall, for the commercial real estate, residential buildings, if you look at this, and you have some states' variation. In some states, they have very strict, like Boston, like Massachusetts. In some states, they are not so stringent. And then you are much easier to build.

So the developers-- because the developers will move, they will move. If some states make the development more and more difficult, they will move to those soft states that are not that difficult.

OK, good. So then finally, I'm so happy that I still have some minutes to discuss another big thing from the government, which is this climate resiliency investment in coastal areas. So that will be not a small stick or small carrots. That will be huge carrots that the government put in the coastal areas but that will be very interesting, a lot of debates.

So this is like-- this part is a continuation from last session. We talked about some frontier topics about climate change, remember? And this one is also very, very, very controversial now for how to invest and whether should we invest-- continue to invest in this climate, vulnerable places.

So the story is the following. The story is the following. Although we know more and more of us, we know that coastal areas are risky in terms of all the climate risks, for example, flooding and hurricanes, but if you look at the population patterns, when you look at the population patterns in the United States, you will see Americans are still moving into high-risk zones for wildfire, drought, and hurricanes.

So this is a blue and green color. They are the inward migration. And this yellow brown is the outward migration. People are still moving to those areas with high risk of the climate disasters.

And this Redfin figure shows us more clearly there's a heat, drought, fire, flood, storm. And then these red bars are countries-- not-- counties with largest share of the homes facing high risk. High-risk areas, red. Low-risk areas, blue.

So for those things, you will see all these people move into high-risk areas of heat, drought, fire, flood, only storm a little bit different. So what do you think about this? Why? This so risky, but people are still moving into.

People move there. They won't all become homeless. There must be a lot of new construction, and people move there. Then they live in houses, and there's a lot of real estate development.

What's going wrong or not wrong? Any thoughts? [INAUDIBLE].

AUDIENCE: Motivations.

SIQI ZHENG: Yeah. Motivations, why?

AUDIENCE: [INAUDIBLE] in that area, I would assume [INAUDIBLE] activity [INAUDIBLE].

SIQI ZHENG: Yeah, OK, because they have jobs, and the economy is strong.

AUDIENCE: You also have [INAUDIBLE] income tax or taxation on personal [INAUDIBLE]?

SIQI ZHENG: Lower, lower tax. That's Florida. I heard Florida is very low tax, but California may be very high. But that's a factor. Any other things? Why people move there, do want to move there?

Yeah. [INAUDIBLE].

AUDIENCE: Cost of living--

SIQI ZHENG: Cost of living.

AUDIENCE: --is better.

SIQI ZHENG: Are you sure? It's the coastal areas.

AUDIENCE: Well, Florida, compared to, say, the Northeast or California. You see East Texas is a huge [INAUDIBLE] area there [INAUDIBLE].

SIQI ZHENG: Yeah, yeah, good. So that's all good things, Good answers. And another thing is people just enjoy, enjoy the view, the ocean, the access to the ocean view and all the sun belt. So anyway, that's a fact.

And there is a paper. Actually, there's a paper in Nature. Then the paper's title is "Building Back Bigger". So those places destroyed or get damaged, despite of this, all the regulatory efforts and hurricane damage is increasing. But if you compare the footprints from 2010 to 2017 or list like that, and you will see more buildings there, more development there. The houses become bigger.

So that's the market trend of this. So that's the market trend. And then an interesting thing, I think I mentioned this because, later, some of you will become developers, and the common belief really plays a role because not all the places-- these are scientific matters. Those are all scientific matters.

But not all people believe in that because some of them so rare, later disasters, they don't believe, climate deniers, not climate believers. So then you will say that developers all rush into those areas with low belief in climate change. All else equal, for example, the scientific evidence, the scientific measure of the climate risks of those areas to never hold the same, climb the risk index.

But these are deniers' neighborhood. These are believers' neighborhood. And the developers all go to this place to build. That's the scientific-- that's their data shows.

So that's very clear because, if they go here, based on our DID analysis, we know based on your P set 2, P set 2 is wrong in Boston data. So Boston has a relatively high climate belief.

But then if you go there, you have discount. You cannot make money. But for the deniers' community, it doesn't matter. So the developers go there.

So thus, I talked about some market trends. People are moving to those areas in spite of the scientific evidence of the climate risk or even some facts. Hurricanes really happened.

And then they build up back and bigger. And developers understand. These are all about individuals or private sector.

And then it's not-- it doesn't mean that they are doing this very recklessly and they don't understand things. They understand, and they understand there's no like-- we are all passive.

We go there, and hurricane comes. And we all die. No. They understand they can do something. That's a climate resiliency investment strategies.

So these strategies can-- if the developer comes to the project, they can do something. And also the city government can do something. The city or the state, they can invest money in this.

And, of course, when the large scale, large scale, the developer can do little and mainly for the city governments. So that's why I put in this session is the city government, or the state government, or the federal government, they can do. But these are all engineering things. I just want to show you.

This is the website. You can look into this later. If you go to some coastal areas for your business, maybe you will get to know more. And also, after the midterm, we will have three sessions of sustainable design. And we will have a guest, the instructor, Carlos, they will talk about all these things.

This build-on field, just how to fill this-- artificial, first, fill this area to get out of the water, then you can build buildings, first to fill this area. And build on the Keys, so this is like pillars to elevate. And there's different things and make this very, very-- absorb the water and all the things.

So these are permeable surfaces. You absorb the water, and you make-- the water can go to the underground. And you preserve white lines, and green space, and this and that. There's many, many strategies.

But I just want-- for now, I'm not going to go into the strategies. But I just want to let you know they all cost the money. This all costs money because these are all big things.

And then, because they are big things, it's not like a carrot. Carrot is so small. It won't work.

It speaks-- it's huge money that government has invested in those places, make all the change. And first, water, under water the ground, then you elevate the entire ground. And you fill and fill.

Then it's not that easy. It's a huge investment. So that's why not all the cities, they can do that. Not all the developers, they can do that, for sure, because they are so small. But even for not all the cities can do that.

Remember last session Ed came in. He talked about Miami. Remember, he mentioned Miami. He said, oh, how can we explain Miami in the last, I forgot, how many years? Each year they have 20%, 30% of housing price increase. If people, they don't care-- if people, they really understand, why are they still keep going to Miami? Let's add a question.

Miami is a rich city. And Miami says, Miami city mayor says they are very confident they can adapt to rising seas. Although not everyone is convinced, but the officials have a big, ambitious plan to manage rising water, succeed or fail. So they can live with water. That's Miami.

But other towns, small towns, very, very miserable. So I will tell a tale of two cities. This is my tale of two cities.

So I will use Miami and North Carolina, small town. I have never been there. I have been to Miami, but I have never been this. Anyone know this town? No.

We got this from media, Fair Bluff. This is a small town. It's a very, very small town and a very relatively poor town.

So this is two extremes. That's a tale of two cities. So for Miami, they are rich, and people like there. People all go tourists and also people after retirement. Maybe they all go there.

Then they have a huge salary, spend so much money for the climate resiliency to all the things, the strategies. They have an upbeat strategy for living with more water. And they say, no problem. We will do everything we can.

And also the-- why the city is so ambitious, they understand they don't want to lose their economic base. They don't want to lose their people. They don't want this climate thing become a factor that's pushing out the buyers and the investors into the city. They want their city to be booming, to be vibrant, so they invest a lot of money.

They keep people. Then people still go there. People still-- the developers still go there. People still go there. Then they generate tax revenue for the city. So this is a positive feedback loop.

So this is very important. This is a feedback loop. So this is the positive feedback loop. The government put money. Put the money in, build, and the resiliency-- remember, all these strategies to live with water.

And then people still moving in, more people, business, tax go up because then you have a lot of base to tax economics. Then you have more money. Then the government becomes richer. Then they continue to invest on this climate resiliency, make this more and more resilient, and the people moving, no problem.

Another thing is-- the other end of the spectrum, if this small town in North Carolina is a Fair Bluff. So for this one, we got this from New York Times newspaper. And then the small rural communities, now you're in a very, very bad situation. So this one is a negative feedback loop.

The negative feedback loop is the following. The small town, at first, are really very poor. No tax base, not that easy to handle things, even the basic public service like schools, health care, hard. Now, combined with the hurricane and all the things, they already struggled economically.

And then people are leaving. Then got hit by 19 hurricanes from 2054-- 1954 to 2016, 19 hurricanes. Cannot bounce back. Money, no money, government to lose money. Government no money.

Poor, poor government. No money. Cannot do any resilience. All the businesses run out of business, closed off. People leaving, then no tax.

People are leaving. Businesses are leaving. No tax. Then further, no money. Then cannot do anything. Then become ghost city, almost.

So that's a negative feedback loop. They have a rebuild plan. And they say, how we can-- we don't want to lose our home. We don't want to lose. This is our community. No plan.

But they have no money. And they have a plan, but they cannot fund. Now, Biden side, our President Biden side.

Bipartisan Infrastructure Act, 2021 located so much money from the Federal Government, $47 billion money for climate resiliency to protect existing infrastructure, all the things. Then this led to a moral hazard thing.

The moral hazard thing, if government say-- Biden has no problem-- trust me, I will spend $47 billion on the coastal areas to protect those areas to build the levee, to build the seawalls, to build all the things. And then the people say, OK, no problem. I will still move to those areas because the government will protect me.

I believe in government. That's called moral hazard is, when the individuals, they consider the things. They consider their choices. They don't consider the risks because they understand later the government will save them.

So that's very similar to this Silicon Valley Bank thing recently, that collapse. The bank, Silicon Valley, their small bank collapsed. And then the Biden says, we are going to save all the money. All the people's savings, we will pay back.

Then later, the individual depositors, they don't consider risk. They just put money in small banks. They understand if the small banks go bankrupt, the government will save them. So they become more and more reckless. So that's the problem of moral hazard.

So this is a moral hazard issue. If Biden promised to all the people to build back, then all the people will still move into those places. However, this inequality issue again-- $47 billion. Which cities will get more money. Which cities, towns will get less money? Which towns won't get any money?

It's totally different. It's not like calculate per capita, how much money per capita like that. Instead, you need to post-- you need to submit a sophisticated proposal to the congress, to the White House. And then you also need to match.

You cannot say money from the Federal Government. If you get money, your local must match. For poor towns, it cannot match at all.

So it's very hard for this town, Fair Bluff town, to get enough money compared to Miami. Miami has so sophisticated officials and do all the things team and do things match. Thus, small town cannot. So there's still another inequality. Finally, one minute is whether this moral hazard thing and inequality thing really let us think twice.

Think twice means whether we really need to save all the places or we retreat. That's called managed retreat. It's not random retreat. So this is managed retreat, like managed like an organized retreat, not always just flee randomly.

So there are some arguments on this, say, don't always rebuild them. Manage them. Manage the disaster. And move some people together from one place to another place because, if not, if random retreat problem, all the people lost their community, lots of friends, social networks.

And then now they are thinking about this. The Obama administration, and [? this ?] [? lot, ?] they're talking about how we can really move the Hurricane Sandy and this and move a community together into another place. However, this is very controversial. It's very politically controversial, and there's a lot of pros and cons for this managed retreat.

So I will leave this as an open-- I have no answer to this, whether you should manage retreat or you should continue to put money here. And the people don't care about risk, moral hazard, and still move into Miami and all those places continue to spend. And who will benefit? Who will lose as the two different types of a tale of two cities?

Open question. Thank you so much for today. This is for you. [LAUGHTER]

[APPLAUSE]

I will take this.