

EEP100 Lecture 22 (Nov 12, 2009)

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I'm taking a big mental note about this. Alright. So remember I was talking about the difference between risk and uncertainty. The idea is that if every person in this class was grading every other person in this class, on the assignment, we would get some kind of bell curve like we're used to. And your grade will probably be where you deserve it. That would be a risk based grading system. But unfortunately, there's only three people that are grading your thing, so there's this uncertainty problem.

And everybody's going...but what if I grade these three people, and I get an F, and I don't deserve it. Now I realize that that fear and that dynamic is in your minds collectively, or some of you, but that unfortunately that has to be the price we pay. It's not going to be the end of the world. I doubt you are going to get three bad draws (three people that just don't understand you). But it's possible, okay? I think the best thing to do is wait till you see what comes back, right?

Don't have a bunch of fear about what could come back, because we have that fear everyday, but we'll wait until we see what's realized.

Secondly, and this is part of the bigger picture, so hopefully the feelings that people are feeling, the anxiety, is actually, I think, a constructive way of understanding (what's called in the business) FUD. Who's heard about that before? What's it stand for, anybody? Fear, uncertainty and doubt.

It's like "Oh my god, I'm having FUD about my grade." And the good news is that you are feeling this (those are you that are feeling it...some of you are like...I'm so bored of this). But those of you are feeling it, I want you to take it thing and file it away when you think about the dynamics of politics, and the way that politicians use FUD all the time to convince people, for example, that we have to go and invade Iraq. Right? Because we have an eminent threat of a nuclear weapon coming from Iraq. That was what was going on back in 2001. And so we went off and invaded this country, and woops, that didn't happen.

Now, I'm not going to say that George Bush was lying, but it was a very powerful dynamic...that people were being manipulated in a political sphere.

If you're feeling FUD about your grade, then now you understand a little bit more about politics. And that's what this class is also about.

The other thing is...and I know you don't want to hear that grades don't matter (they don't, learning matters). All of the people that are here know that learning matters, because you're still here. The people that are not here (you guys, if you're even watching the tape) I don't know what to say.

My sympathy, as I said, is very, very small. The distribution of grades right now is 73% (as average). Is that normal for a UC Berkeley class? Or are you guys all above average?

Because there's a lot of grade fear going around, and I don't know what's going on. But remember that only 35 of your points have been assigned so far. Oh god. Yeah. You know. Are grades all that matter? Is money all that matters? This is the whole point of economics.

Remember, economists...we don't study money, we study happiness. And what makes you happy may not be money. That's the whole intrinsic motivation thing, right? So I'm just trying to touch on a few things, just in case you needed some kind of philosophical background about why you shouldn't care about this whole firestorm of "Oh my god! I might get a bad grade on an assignment, oh no!"

And then there was an e-mail that I got from someone saying... "I didn't feel like I had the tools to answer this question very well. I didn't feel prepared. I did read *The Logic of Collective Action*." Somebody was actually doing their work. But the thing that was important that this person was saying was: "I felt a little bit out of my depth."

And I gave you this assignment not just to push you in terms of being a professional and writing in an encyclopedia entry.

I gave it to you to push you to think about these issues, even if you've never thought about before. Even if you feel like it's out of your death. The whole point is that you're going to give it a shot.

In the process of thinking about it, and writing about it, you will learn about it, and that, of course, is the lesson. That's what you're meant to do.

So doing a perfect job is not the point. Right? Thinking about it and getting into it is the point.

Last thing, logistically...I want you to bring two copies of every grade. Write this down. Here's the protocol. This is going to be front copy, second copy. This is the original that you're grading, right? So that's the brief. This is your grade. And this is the copy of the grade of that brief, okay?

And that's because we the graders are going to grade your grade, tear that off, return that to you. We'll leave one there for the person whose brief it is. Does that make sense? Everybody understand that? Unfortunately, I'm going to have to send an e-mail because clearly half the class isn't even here.

But you all have got the heads up. And I will send people out in the corridor to go do their work.

Bring in three copies, staple them together. What did I say...your SID is supposed to be where?

Right.

Yours is top right. You. And theirs is top left. Is that right? Did I say that? I'm trying to be consistent, but I'm old.

Top left is the gradee.

Top left is gradee. You're the grader.

I know, but you said gradee.

Okay, yeah. That's the gradee.

Yeah? That's all I have to say. Are there any more questions for the moment? Can we let this one sit for a little while? I really appreciate the dialogue that we've had. I think all of your concerns are valid.

And it's a learning process. Anything else open?

So we need to find out...like the person has the mentioned the...

I forgot a big point. How are we supposed to grade? I've said it a million time, right? In the original assignment, what you're supposed to do is you're supposed to write a briefing for a politician. You're supposed to address getting reelected more than anything. So some people said, "I implied this. I wrote about stuff, and special interests are implied."

If you are the grader, and you're reading it, and you're like...and you're the politician. Step in the politician's shoes. And you say, "Okay. I'm reading this; I think I can get reelected with this." That's what I want you to be thinking. Can I get reelected with this. Okay? If they don't say that the special interest is going to have a 0.25% share, it doesn't matter.

Here's an important point. There's an overlap between a briefing and addressing special interests. This is where you want to be. This is the sweet spot. You write a briefing that does address special interests, okay?

If you wrote a briefing and you don't do it, implicitly or explicitly, then you have done the wrong thing. If you just write about special interests, which is not a briefing, which nobody was doing, it would be bad. But if you write well, you write a good briefing, and you're addressing this implicitly or explicitly so that the person who is reading it (you the grader) can understand how to get reelected, then you've done fine, okay? You don't have to have a whole section called special interests.

I hope that is a clarification, not an obfuscation. I've been saying it fairly consistently. But there was some fear about people that I didn't address it correctly, but if you got into the dynamics of who would be affected or can you get reelected, then you did okay. You did fine.

If you did a good briefing, you did fine.

If you did a briefing saying that everybody in Berkeley should buy a whale because whales are good. It's not going to work. Because everybody in Berkeley is not going to support you for reelections.

So if you went off into la la land about your dream, and you didn't address these kinds of distribution questions, then you made a mistake. I think that's it.

That's not it.

So if there is a sentence that says, "I think this will get you reelected" but it really doesn't...then does that count

If it's credible. You sit there and read it and say, "No it won't" and when you grade it, say, "no it won't". I don't believe you. Your analysis fails to take this into consideration. Or thank god you said that, because I'll get reelected.

I also think there is like a huge space constraint. So a lot of people didn't want to go through this whole prompt, because you already knew that, so I think you should just go in thinking that already.

Right.

Politicians are obviously trying to get reelected.

I mean...if you sit there and you say...my policy is to kiss as many babies as possible in the special interest baby lobby kissing whatever...I mean...that's fine. But you have to fit it in there.

I don't even know how to address this thing. There's like 90 different people with all these different opinions about what's right. And I'm sitting in the middle trying to reconcile? Impossible.

And I try to be a dictator, and it's like, "Oh you're being vague."

Just use your best judgment. You're adults. Can we just leave it at that? Ties, go ahead and talk.

Alright. This is an experiment, but yeah...I couldn't follow at all...but yeah, do your best. You're going to have to do it more in the future I think...reviewing other people's work. So you better practice your integrity!

I'm from Holland. I met through a friend of mine who knows David. Who met David at a party. So I do get that...this is not a water economics class right? This is more like a general economics class. So you're going to see a lot of water engineering stuff for the next hour. So... yeah. Just try to enjoy engineering. And I'll try to focus on the economics of the matter.

So first I have to focus on the IT of the matter because this is my...that is my desktop and not my presentation.

So we'll see how that will turn out. Didn't we 15 minutes ago have...

So I'm from Delft University of Technology, and I work at the department of hydraulic engineering. But half of the time I spend for institutions that are both...that have to unite different faculties. So their interfacultarian solutions.

I'm originally a product designer. I worked in the field of floating houses as a matter of fact. Then I went to the faculty of architecture, and then I went to the faculty of civil engineering. So that's why I have now this job of initiating products that unite these three faculties. And then there's a fourth faculty that is policy analysis. I'm going to...

We don't have a remote? Anyways. So Delft University of technology. So, now, the Netherlands. This is of course an image from Google.

When I pasted this, I realized that the good thing about Google is that everybody who uses it feels like he's in the center of the universe.

This is Holland—a very small country. Let's zoom here.

We have the United Kingdom here, Belgium there, and Germany there. And these are the same scales, so you see that our lake is bigger than yours.

As you might know from Al Gore's movie, this is the western part and it's all below sea level. At high tide it's 2/3 and at low tide it's 50%. You understand how that works?

So obviously it's protected by dikes. And if you have no dikes, then the country is going to get flooded all the time. These are major rivers coming in. This is the Rheine, the Meuse, and the Scheldt. It separates into a bunch of branches, and also, not only the boulders that are below sea level, but also the boulders that are below river level are also endangered by climate change.

Now why don't we spend a little bit of time on a tour through my wonderful country? I learned patriotism from your country, actually.

So welcome to the Netherlands...foggy country. That was our flag. You see the stripes; everything is flat.

I'm also a photographer. This is my work.

Now, of course, I want to show a couple things with this slide show. It's a small country, but you know...fourth airport in Europe. Biggest port in Europe. We are the third export country of agricultural goods. So that's sort of interesting for such a small country.

And as you might have seen...I was having a friend of mine over...I like to take them through a tour of Rotterdam. And it's just so overwhelming. It's so big. So this American guy was saying, "I can't believe that it's all so big! Just the size of this!"

That's usually what you'd expect someone to say when he's in America. Instead of America in Holland. Anyway. Another theme that I wanted to show how intermingled the landscape is with the water. I mean...at least half of the pictures...maybe 75% showed water, and a lot of pictures showed, so-called, primary flood defense. Say 2000 miles of dikes and dunes that protect all that capital.

That was mainly the goal of the slideshow. I'm going to talk about that. About our primary water system. Once more...part of the Netherlands below sea level, part of the Netherlands threatened by river floods.

Of course this debate has been enhanced by climate change. You can imagine.

This is what a dike looks like. This is another picture of the dike. This is a typical, very Dutch picture. Kids through the fog, driving to school on bike. Now you would think practically/theoretically if sea level rises, then all we have to do is raise the dikes.

And I'm a product designer, so I came up with an idea. It's a very simple thing. It drives over the dikes and takes good care of the environment. It just hops over that little fence there. And the bike riders can keep on riding while the machine is working. So it's not a typical engineering solution.

And what's more is...well, we have to raise the dikes anyway, why wouldn't we cover all of them in tulips, and make the landscape even nicer. Here's another image. It also complies with the regulations. It won't go past 60 km an hour. So, you know, we're done actually. It travels only 20 meters an hour. And if sea level rises 1.2 meters per century, and it raises the dike only 7 inches, it will just slowly cruise around the Dutch dikes, and in 6 times, it will raise them all, and then we're done. We're fine.

So basically that's all I have to say. Victory on the war on water guaranteed, thank you very much. No...of course. It's not like that. A lot of dikes look like this. You see?

It's not easy to modify the landscape on a grand scale. So this simple of fact of all the houses that are built leaning on a large part of the dikes makes the debate a lot more difficult.

For example...therefore you cannot...you couldn't be talking about the water...against the forces of nature. It's more of a war against each other. Struggle.

For example, what could you say about the ultimate dike operator. It will ruin our dike houses. It's a typical silly engineering solution.

We should better let nature run its course. The thing will be way to expensive.

These are three arguments as part of a struggle over how to manipulate the forces of nature to our benefit that I want to put central in my talk about the Dutch system. It's about conflict.

So the first point that I made is about raising the dikes for all the people who live...who are protected by the dikes versus the people have their houses leaning on the dikes.

So that's a conflict between sectors...or between scale levels. You could say that this sector is dike dwellers, or you can say the scale level is the scale of the whole dike range that is protected by the dike versus for example, what you could call a regional scale versus a local scale, which are the villages built around or on the dikes.

That's what I would call one level conflict.

By the way I'm not a social scientist, I just came up with this. These three possible sources of conflict. Between sectors and scale levels, farmers versus ecologists, that kind of thing.

But also, you could also says...we agree on the interplay of interests. But we disagree on the method to achieve this certain goal. So we agree on the goal, but we disagree on the method.

And usually, the method that you choose has to do with your vision. Your mindset. Your belief.

In this case, for example, we don't like silly engineering solutions. We want some kind of [inaudible] approach. You could call those two attitudes.

Third level is a conflict that could be going on, on a higher level. Say we agree on the goals (some sectors get hit, some sectors get benefitted, and somehow everybody agrees). A sort of a common mindset, sort of kind of a philosophy of how to approach this problem.

But then on a higher scale level, where the government has to decide between infrastructure and flood protection versus healthcare, or the military or something, there is a conflict and still a project like raising the dikes (or whatever modification to the water system) won't go through

Now I'm going to explain to you a little bit on the history of the Dutch water system.

First...two examples of the biggest hydraulic engineering project in the Netherlands. And the main conflict that has been resolved leading to the possibility of bills.

This is the closure dam. The big closure dam. The lake that I showed you compared to the San Francisco Bay? It used to be an inland sea. So this dam was not there. The sea stretched all the way...something like 100 miles to the southwest. And by building this dam, first, it lowers the water levels here when there's a storm there. That's a benefit of that big dam. And second, it creates a fresh water reservoir there.

And you might know from the California water system that, of course, fresh water reservoirs are very important for agriculture and drinking water.

For a while, the construction of this dam started about 200 years ago. For a while people did not know whether it was a good idea. But pretty soon, they were. But it was such a huge investment, that for decades, allocating the national tax revenues towards this project was the main bottleneck. And it was actually an engineer that became minister of the infrastructure for three subsequent periods of four years that eventually pushed things through and allocated the funding (the national funding) to build this.

Second one is conflict over interest. This is an estuary in the south. The North Sea is there and the Estuary is here...ah that's not correct actually. The North Sea is here and the Estuary is there. And you can see that by the tide flowing in like that. And the original idea was to make a dam comparable to the one you saw before which is just a dam that just completely separates these two water bodies.

However there was a strong political debate in the 1970s because closing the estuary would kill a lot of flora and fauna in the estuary, so eventually a much more expensive solution was chosen.

These are all gates that are usually open and let the tide go in and out. And they only close once in a couple of years when there is a severe storm at sea. A little bit of Dutch water history, where I want to focus in on the conflict since politics and economics is your field, as I understand.

You can say that Holland is the biggest machine in the world. It is a machine that is covered by plants and buildings. And maybe some of you know about Holland. You know the expression "God created the world, but the Dutch created Netherlands".

It makes a lot of sense, I think.

And the core engineering fundamentals of building this water machine is that we turn water into land, we turn land into water (for example we digging a canal)

Or what we also do is we extract a lot of peat from the soil, which turns marshes into lakes. And what is also very important is that in a delta (in a natural delta) the border between water in land

is not clear. It changes all the time. Every time there's a storm it changes. There's ebb and flow, there are high river discharges and low river discharges.

So a large portion of the delta is neither land nor water. And that is very impractical. When you live somewhere, and at any time the water can come, you'd rather be (you were talking about risk and uncertainty) you'd rather know what you're up to when you're going to run a farm or some kind of business.

So we did that also a lot. We turned a lot of tidal areas into permanent land. But sometimes also, we turned tidal areas into water (for example making a port).

But the general development is more control over the water.

For a while this has been very unfashionable. We want nature; we want more influence of nature. Once I...in a discussion about that, I took a glass of water and I just poured it over the table, and I said, "Do you like this or not?" to indicate that control over water is actually a very nice thing. Very practical thing.

Europeans have been around for a long while as you might know. So we start at the age of 500. Couple of activities I want to highlight (that I want to reveal to you). Damming and poldering.

A dam. What a dam does...there's a river, and it ends in a sea, usually, or in a bigger river, and when you dam that river, it has a lot advantages. You can control the water level of the river, so ships can move more easily. You block the salt water coming in, so you can use the fresh water for agriculture,

You protect against flooding, and it's also a connection between the two shores. So there's a lot of dams in Holland. We started with the small rivers, and as technology and financial resources grew, we dammed more and more. Bigger rivers.

Then there's poldering. Poldering means gaining control over a water level in an area by making a dike around this. And a pumping station or a windmill to keep the level of the river at a desired height. I'll show you how this works through this drawing. You can consider some kind of a harsh landscape. Really bad weather, and a lot of water, and the Romans who described our country were always very...you don't want to go there. It's too wet. So of course we started building houses on the hills. Not that there are many, but at least...and as population grew, we moved closer towards the water. First building on stilts or the mounds. And then we...it's not so practical (those mounds) because cattle and crops...

So we started making the dikes to squeeze the water in. And as we drained these lands, the land subsided.

And we had to keep the groundwater table basically under the land, and we used windmills to pump that water out. Now which are the conflicts at those times?

The simple one is...usually the fishermen weren't too much in favor of decreasing the surface area of the water. You can imagine. But somehow the farmers, you can imagine, usually won that debate. The second one is that mentality issue. I don't say that the church would have been

against dikes, but they did use floods to gain power over people because they'd say, "You see, this is an act of God for this crime that you have committed."

You have to imagine that basically for a while, there was a conflict between the early mounds and the dikes. And the dikes are longer. So they require more collaboration and a view farther in the future. So that was also a conflict at those times. Are we going to focus on the present? Or are we going to unite and invest on long term. And it is plain that this debate, this argument, has brought the Netherland a lot of prosperity, because they learned to collaborate, and thereby also create a powerful state in a very early stage of their development. Thanks to or because of the threat of the water that requires collaboration. Another struggle at the time was that...making a dike now is a lot easier because of the technology we have. And at that time, it demanded a lot of labor and a lot of capital for a regional community to build it. People could also farm or wage wars, but they allocated 5% of the workforce on building those dikes. And that has not always been so easy.

So...big struggle against nature but also against each other in it's early stage.

That poldering activity went on and controlled the water...and went on to present day. But I do divide history into a couple phases with the dominant, new, added technology in that phase.

Second phase: 1500-1700: the Golden Age (you might have heard) of the Netherlands. The merchants who went all over the world and made us...yeah, brought a lot of capital into the Netherlands was between 1580 and 1672...something like that? And the rich merchants invested their capital to some extent in draining lakes.

Once more, Holland was a Delta with a lot of lakes, and also with a lot of inland seas. And those were very serious, large undertakings. It could take years to drain the lake. It would take years to build the infrastructure to enable a lake to be drained. And it took a long time to allocate the financial resources. And there were very concrete...there were always protests. You would think that draining the lake would be very practical in initiating agriculture in the remaining land. But for example...duck-egg collectors (I read that recently in a book)...they did not like the lakes to be drained, for example. They protested very fiercely. Same for skippers. But the cities wanted to drain the lakes for two reasons.

Sometimes a storm could be so severe, that the storm raging on like that would push the water in that direction, and seriously threaten the city.

So either you make a dike to protect the water, or you just take the water out. So that was the debate between fishermen, skippers, and duck-egg collectors against cities for reasons of flood, tech, and food production. So the cities also realized that draining a lake, reclaiming the land, would increase the growing up wheat and crops like that.

And interesting thing to be aware of is that draining a lake in those days was a very risky undertaking. I mean...a lot of things go wrong. For example, you could build 10 very expensive windmills, and they could get set on fire by the duck-egg collectors. Or a dike that was built was leaking somewhere and costs a lot. So that was also the debate that was going on. The conflict between risk aversion versus entrepreneurship. The rich people could invest abroad, for example. That's one of the reasons the global age ended, by the way. A lot of rich people started to invest in Belgium, in Germany, and England. Anyway.

You can say that from 1700 to 1900, there was still a lot of reclamation going on. A big, inland sea was reclaimed in the 19th century. But interesting development in these two centuries was increasing the shipping routes from Holland to Germany. And that was done by a number of ways there. There was a debate going on...how...the biggest debate was that actually, the Germans wanted us to allocate our resources in improving the shipping capacity of the rivers because you must imagine that a lot of rivers that we see now have a standardized depth and a standardized width. But that has not always been the case. Sometimes rivers are very shallow and very broad. Sometimes the rivers are narrower and deeper. But the depth of a ship only has to be only as deep as the shallowest part of the river. So by dredging (that's called making groins)...anybody know what groins are? This a groin. Engineered elements to direct a river flow, so the flow of the river dredges the sand out to create a standard depth. So the big debate in that plan was that

The Germans wanted us to invest/direct river works toward better shipping conditions. But we actually preferred to make higher dikes to prevent flooding to the villages and the farmlands surrounding the rivers.

So that was serious diplomatic power play in those years. And eventually they did both. We both improved the shipping capacity of the river, and we made the dikes high enough to prevent river flooding.

So once more...the first level of conflict is between interest groups. The second level is between mentalities. And the third level is where do we allocate our natural resources/funding/budget.

Now the 20th century was the century of the big engineering projects and largely on activities that could be called shortening coastline. If you see the coastline as this long, as this length, and these are estuaries, it can stretch over a thousand miles. At first we started making these small dams...damming these small rivers, shortening, already, the coastline. And in the 20th century, we have the technology and the money to dam even these estuaries.

By the way this is that big dam that, both, is able to shut off this estuary and let water through under normal circumstances.

Now. What are the debates there?

For awhile...I would say until the 70s...there was just no awareness of the fact that making a dam like that and turning this estuary into a freshwater lake (I hope that you can imagine what happens when you make a dam like that). Some people talk about this for the delta here in California. But slowly the awareness grew that when you dam an estuary like that, and turn it into a freshwater lake, it kills...it destroys the ecological system. So that was the debate that continues on to today over this type of activity of shortening the coastlines through dams. Economic mindset versus an ecological mindset. I'm not a fan of that mindset.

I would rather say engineering mindset. Sort of a...no nonsense...relatively cheap solution is a dam.

But when you approach ecology from an economic perspective, you cannot say that there's an economic mindset and there's an ecological mindset.

But anyway I hope you sort of get the power play that was going on here. And another thing was...it's very expensive to build these dams. Especially this particular type dam...that's actually the one I photographed there.

But the funny thing is, in the 50s or 60s, we discovered a huge natural gas resource in the north of the Netherlands, and that brought so much money in, that that made it easier to choose for the expensive, closeable dam over there.

So that's how you see that 3rd level of conflict can be solved with money.

David is opposed to throwing money at a problem, but sometimes it can, of course, help.

This is a closure masterpiece (they call it). The development of shortening the coast line.

This is basically the mouth of the Rheine—one of the major Dutch rivers. And we want to keep it open; we don't build a dam just like that because we want the ships to go freely in and out. That's one of the reasons why Rotterdam has been the biggest port of the world for a century or so. And now the biggest ones in Europe.

It's simply because...one of the reasons is because there are no locks. Because locks slow shipping down. It's very nice for ships to just freely go in and out of a port, and just cruise all the way to Germany. So the idea behind...this is, by the way, the length of the Eiffel Tower. And it only closes about once in ten years when the sea level on that side is so high that it threatens the city of Rotterdam on that side.

Now...you see that the periods are getting shorter as we are reaching present day. 1993 to 2009...I would say the most water engineering projects went into the river system. And the debate is between two mentalities, really.

Raising the dikes is seen as conventional, traditional mentality.

And widening the rivers is seen as an innovative and progressive mentality. Has anybody heard of something called "Room for the Rivers"? Is that something that's going on in the United States as well? Does that ring a bell to you David? No?

Not yet.

Anyway.

It works like this. A river...if there would be no dikes along the rivers...the river would just... anytime in winter where there's a lot of water discharge, it would overflow the flood planes, and sometimes they can stretch very long, and it's very impractical for farms and houses that are built there. So that's why in all over the world, we build dikes along the rivers. And if, for some reason, the river discharge increases, or if we want more safety, we can raise the dikes. This yellow part is an example of that. And we've been doing that in the Netherlands for so long, that people didn't like it so much anymore. And because of those houses that I showed you that I built on the dikes.

And another way to lower the river water level is to remove the dike. But in general, it's a much more expensive way of dealing with this problem. Here's an example of how that works. This is

the Ole River by the way. This is a canal that they dug, because a canal is more controllable. You can control the river flow better.

And this is the current dike, and now the idea is that...or the project that's going to be built is to remove this dike and build a dike here. So when high water comes, this whole area gets flooded, and the total water level, as you can imagine, is lower. And this whole area gets flooded. Then we're in just this area...between this dike and that dike would get flooded.

So that's the program "Room for the Rivers". Those two mindsets...I'll get back to that later. I'll get back to it now actually. This was actually the debate that inspired me to design this optimal dike operator. Because for a while, two things were heard in the debate over the water system. One was we cannot raise dikes anymore for all kinds of reasons that were not so well articulated.

But mostly, it was just...we don't want to keep doing the same thing again. And on the other hand, the politicians were saying...

Climate change is the biggest threat to the Netherlands, and we have to spend a lot of money to work on that. Our frustration at the university was...if you say that climate change is the biggest threat, then you cannot say that raising dikes is not an option. You have to consider that in the whole range of options.

And this was mockery, on my part, over that urge that politicians and professionals can have to be innovative. I personally feel that you shouldn't be innovative for the sake of innovative. You should be innovative because you want to solve certain problems.

But if traditional methods can solve that problem better, then don't innovate for the sake of innovation. Something to think about, I hope, in this country of innovation in California. Anyway.

More history. How did conflicts get resolved? I explained this a little bit. But I think it comes down to...often a disaster happened. A flooding, mostly. And if there are groups quarreling with each other, a disaster often points its nose in one direction, and because of the trauma that usually is left behind after a disaster, often the mindset, they way of thinking, focuses, and that makes it easier to conduct a project. And you can imagine that when a natural disaster happens, that the funding is easier to raise. Funds are easier to raise.

Another raise to resolve a conflict: A strong authority. I get that that's a problem right now in California, when it comes to investing in a California water system.

Again, to persuade a group that is disadvantaged, to advocate a mindset or a belief, an approach to a problem, and obviously to lobby for money in the national treasury.

It could also happen that times are so prosperous, that money makes it possible to have a more extensive solution that compromises different interest. The opposite can also happen. During World War Two, some big reclamation project went on, but we can say...especially right after WW2, we spent more money on building houses and rebuilding the road and rail infrastructure, and we sort of neglected the dikes.

In 1953 we had a huge traumatizing flooding in the southwest of the country because we didn't spend enough money, because of World War II, on maintaining the dikes properly.

When you read the history on the water system, you see the persistence. Sometimes it could take a century and keep on studying, keep on thinking, keep on debating about something and that's a very simple thing you can take with you into conflict. Persistence.

And then...number 5, not every body can read it, but it's says academic rational objective analysis, and of course...I don't have to defend that in a university.

Now. From history to future. And now we get to the project that I am personally involved in. I must say that the current Dutch water system is functioning pretty well. We have very low probabilities of flooding. We have very good shipping conditions.

It sometimes happens that we have a drought (not enough water coming in, and agriculture suffers from that) but relatively that's pretty well organized. The weakest aspect is ecology because it's only been 3 or 4 decades that we even care about ecology...that a lot of infrastructure has been built, as it destroys a lot of ecosystem. So that turns into a driver for changing the system. For altering the system. As I said. Climate change—a big driver for big projects like...billion euro projects to modify the system. And when it comes to flood safety, you just say okay...you have a probability of 1 in 10 thousand of getting flooded. And we want a probability of 1 in 100 thousand because we have so much capital to protect. It's a very political question what the protections are that you want.

I take a bet or I want to be absolutely safe. There are economic ways to calculate that, but what it comes down to is quite a political question. How safe do you want to be?

And there's also the new goals. You can alter change...water systems...more lakes, or make the rivers wider, so they will become more beautiful for the purpose of recreation, landscape quality, and nature development.

Okay...now how could those projects look like. This is important; this is the Maslow Pyramid. Who knows the Maslow Pyramid? I suppose you are all watching each other because when someone sticks his hand up, you can use that and grade each other on your reports, right?

You can imagine that in the water system, basic functions like flood protection, agricultural water supply, and shipping correspond to the lower parts of the Maslow pyramid.

While recreation, and housing with water, which is nice...and nature development are sort of higher in the Maslow hierarchy.

This is what my personal academic research focused on. And then there's climate change.

And you can imagine that climate change mostly deals with what's happening down here in the pyramid. Flood safety is threatened by climate change. Agricultural can be threatened by climate change, and that's where we like to spend our money the most—down there in the Maslow Pyramid.

Now what are the scenarios that the government is working with when it comes to climate change? For you to know that the sea level has been already rising in the last century. 20

centimeters in the last century. And this is already, by our Dutch scientists, considered the lowest sea level rise that we are counting on. And...there was a national, influential committee that said, "Well you better prepare for the worst scenario."

You can think about whether you think that is a good strategy or not. I think it depends on how much money have to spend. But they say...if you build a bridge, you prepare for the biggest truck that will drive over the bridge. So when we rebuild our water system, you better prepare for the worst climate change scenario. It's a very big debate because it's about a lot of money. So that committee is similar to the blue ribbon task force committee that you had? Is that the vision committee? Or maybe...some of you heard about that? That's usually what governments do when they want a big project that requires a lot of money. They establish a committee with important people...that is to judge on whether the money will be well spent on or not.

So this is from the report of the committee—all kinds of projects throughout the country. And this is an overview of all the dikes that are not good the way they are now. All the blue ones. And my personal research...what I do is I like to think about those matters of conflict, for example, and the Maslow Pyramid, but my way to engage in the debate is to come up with concrete project ideas.

And somehow, coincidentally, they focus on these red areas, which are the areas that the committee indicated that that requires further study.

And not surprisingly my ideas are focusing on those areas.

I will show you.

Here's Amsterdam, here's Rotterdam. Here's the river Rheine coming in. Here's Antwerp. That's Belgium. Just for you to get a picture of the country.

First we go to a lake. I won't bore you...I won't explain the details to you, but these are all lakes. This is that estuary with that complicated dam. That's a former estuary that's turned into a lake. So they're all dams here. And the problem with this particular lake is that the water doesn't flow very fast and the ecology is really bad. There are blue algae that are poisonous and all that. And we really have to clean that lake. So we agree on the...

But agriculture still retrieves water from this lake when the water is good enough. And one of the ways to change the water quality is to turn the fresh water lake back into a salt-water lake. That will cost something...it could only cost something like 100 to 200 million Euros. But not much will change. Only the water quality. And we came up (at Delft University of Technology) with a different solution.

We said, "Why don't you make a canal like that." I'll show you how it works. And not simply make the fresh water lake salt, but connect the freshwater lake to this lake that not only has a lot of salt, but also has a lot of tidal dynamics. And it creates much nicer nature. I will show you some graphics just for you to get an image of how we're building this machine. This is how it is now. This is a complicated dam because this is fresh and this is salt, and they shouldn't mix.

And we have these reservoirs. This is a canal that goes from Rotterdam over there to Antwerp. Now our solution would look like that. You see? Just...you know...and so the idea was just to

completely remove this dam and make the canal like that, so all the bad stuff is happening in the canal, but you accept that.

And this whole lake, instead of being a dreadful nasty lake...you connect it to this lake and ecology is all nice.

And you have migratory birds, for example...they like sand plates that are covered with just a little bit of water. That's what they like best.

And here you see the dam being removed and the plate emerging, and the same is happening here. You get...instead of boring vegetation, you get these tidal planes

Now what are the conflicts here? Farmers versus ecologists? That conflict has been solved, basically, by saying, "Okay, we can change. We have to improve the water quality of that lake."

But the farmers may not be disadvantaged. So some kind of solution has to be found to get the fresh water for the farmers somewhere else.

And then we have only 10 minutes left. The problem solving mindset versus the integrated regional improvement mindset. That's a debate that's still being fought.

I think that the current attitude is solving the problem with blue algae.

I think we can get much more out of that project if we take a broader perspective.

And the big thing that we argue about now is how much tax money can we spend on improving ecology. How many taxpayers find that worthwhile? And that's an important issue for each of you to think about if you ever get into some kind of politics, because I think that will become a very important issue in the near future.

This is another problem...this is our big reservoir for all the agricultural land in the north. And what happens is that we...the Rheine water flows in, fills this reservoir, and here's that big dam, and the water flows into the sea by gravity. And that happens there.

If sea level rises, the water from the sea cannot flow anymore because the sea level is too high

So there are two options then: it's raising the dikes along that lake, so the water level can rise again, and we can, against gravity, flow back into sea. Or we can make a pumping station and pump the water out.

Now pumping stations at this moment are very unpopular in the Netherlands.

But raising the dikes is also very unpopular.

So this is a lose-lose situation. You must know of the win-win situation.

And as Delft University of technology, our way to engage in the debate is to come up with our alternatives. And my alternative is to say, "Well, we don't like raising the dikes, it costs a lot of money, the people who live there don't like it. But to reduce the harm of pumping the water out, we reduce the influx of water by a modern ecologically friendly way or a dam that we can build

right here. You don't have to understand all of it. But just a little of how we play with water in the Netherlands. And it takes a long debate before we make a decision.

Okay. What are the conflicts here? Dike villages versus the state. The state is saying they want this big water reservoir, the state can say we don't want a big pumping station because it doesn't feel good, and it creates carbon dioxide. Or it creates a big energy bill.

And that's a big debate. And then there are people who say, "Well, pumping and building dams is an engineering mindset, and we don't like that. We like moving along with water, raising the dikes, and allowing the water to flow freely into sea is more of a sense of moving along with the water.

And then the big debate is how serious is climate change. Because that's...if we are sure, then we measure the pace of climate change. But that would be a good incentive to spend a lot of money on it when we're not sure yet. We're not sure what you want to spend the money on...

Now these are projects that we are, at the university...it's not so easy to break into the debate, but here, when it comes to Rotterdam, we have a very good position.

This is actually a drawing of mind that was adopted by that committee that I talked about. So that was a huge success for our university. And I'll show you how it works. Basically, what it comes down to...we have Rotterdam here. So this is urbanized. You see? This dark stuff is all urbanized.

This region is threatened by extortion from here. And the river flux from the river Rheine coming in from there. You can imagine that two waves of water coming together is a particularly high risk.

And this is where you...these are about to two or three million living close the water, and all the waterfronts are more or less organized as you see here. So you can...so can have...just to give you an impression of it...oh...climate issue. That is a big issue. I mean...I can just imagine the risk rising here, and what levels are rising here. Seriously, they're going to be in trouble. It's already happening like this. This is, so-called, outside of the dike building.

Now. I'll go through this quickly, but for you that understand what a Dutch waterfront looks like... This is for the people in the back. It's not just a dike and just water; there's also an outer dike area. And for last century, also, the other dike has been built. There has been development going on there.

It varies where you are. Factories, dwellings, recreation, and basically there a two reasons why we're going to alter the 300 kilometers of waterfront. It's a huge project. Wither we have a more strict law, and the law in Holland...our flood risk is determined by law. And we are the only country who has a law that prescribes a certain flood safety norms. Or a climate change. If the law stays the same, but the climate changes. The dikes still don't need the law. Or if both happens...so that would then mean we would have to raise the dikes and all conflicts will emerge to the idea that I just described.

Now. Here we have that region again. We have water...seas threatening from the west, rivers threatening from the east. We already have a bunch of dams...we could...if we don't do

anything, the probability of a dike failure will grow when climate change advances. And an interesting solution would be to also protect this urbanized area by new barriers to build like that. And as a second advantage, it would also protect (better) this outside of the dike region.

And the last thing about the relationship between a local interest and a national policy.

If you, on a national scale, would choose to protect the inner dike region more...it also could benefit the waterfronts. If you're a developer and I ask you... "There are two pieces of water front property". One with a probability that the water can come high off this much. And one with a guarantee that the water will not get higher than this...which one would you prefer? You would probably prefer the waterfront with the controlled water level.

Now that would mean that the national government would benefit developers, and local governments. But that's the important concept that is going on there.

Dwellers versus skippers. Yeah. That's an important issue here also. If you make these barriers, if they close, say, once a year, ships can't pass. So that's an important conflict that we have to resolve. And what I explained. Water front development is state... is tax money worthwhile to spend on enhancing conditions for waterfront development? National level versus local level. Now, I'm going to end.

This is the place where the river splits in two. I hope that somehow you can feel the fascination for a water system like that, and how it serves as a big machine that people live upon. And how challenging it is to change a system like that. What you might also think about for yourself, if you're going into economics or into politics, how you want to relate to those different levels of conflict that I described. You might want to promote the interests of a certain region where you are associated with. Or a certain sector like ecology or farming or something that you have feelings for. And for me personally...or on the third level, you might go into politics, and I have opinions about whether you want to spend money on healthcare, defense, or infrastructure. I'm not sure if I'm ready for that, yet. But after my conversation with David, maybe we should have some more, and you can give me some courage to move to that...and same for you guys. I would highly admire it if you dare to take on those problems on the higher level of allocating funds.

When it comes to sectors and scale levels, I feel that I would like to advocate investments in that higher region of the Maslow Pyramid? It's somehow safe to keep investing in the base of that pyramid, but I think we could also...we should be grateful that we have the money we have to invest into making the country more attractive and enhancing ecology. I'd like to take a stand for that.

And when it comes to mindsets, I'm not really a religious kind of person. For example, for a guy...I kind of...or perspective or something like that. I like the academic mindset, of course. Analytically, I'm not wanting to sell a product, but care about the quality of the debate surrounding these kinds of issues. Okay. And to illustrate my belief in solutions coming forth from a severe debate that can join different perspectives...I love this image because it shows that there is a combination between ecology and engineering...big infrastructure that is technically possible.

Thank you for having me and I wish you all wisdom in your career.

Transcribed and checked for accuracy by Brynna Bunnag