

Environment in Asia Lecture Series featuring Ruth Mostern – The Yellow River: A Natural and Unnatural History, October 13, 2021

– Okay, I can see they're more than 60 guests logged in, so, how about we start? I can introduce the event and more people can come in. Okay, great. Hello everybody, good afternoon, good evening and a good morning to many of you wherever you are in the world, thank you for coming to today's event for the Series, Environment in Asia at Fairbank Center for Chinese Studies at Harvard University. My name is Ling Zhang, Zhang Ling, in Chinese way, I'm associate professor at Boston College, I'm environmental historian for Tang Song period of China. As a research associate at Fairbank Center, I convene the research series called Environment in Asia. For many colleagues and friends, I want to thank you for supporting the series in the past many years, and I encourage you to continue working, supporting, and following us. If you will like to reach out and check out our future events, you're encouraged to check out Fairbank Center for Chinese Studies at the events section, you can Google that. Also, I know Fairbank Center now publishing many of the past events in recorded forms in a YouTube channel, so you can actually go to YouTube and look for our previous events. So, our next event, I want to emphasize this, if you are interested, please do mark your calendar for November 5th, we are inviting Professor Ying Jia Tan from Wesleyan University who's going to come to talk about his new book, about energy history of modern China with a focus on electricity, that will be very interesting. So November 5th, Friday, please pay attention to that, mark it down, I would like to see many of you coming back for that event. All right, without further ado, let me turn to today's event. So, it's my great pleasure to introduce to you our wonderful friend, friend of Fairbank Center for Chinese Studies for many years, who's been supporting our program and personal friend and a colleague Ruth Mostern. Professor Ruth Mostern is an associate professor at University of Pittsburgh and also, there she's also the director for the World of History Center. Professor Ruth Mostern is a specialist in spatial and environmental history with a focus on Imperial China and the world. She is also a interdisciplinary scholar with research interests, bridging the humanities, social sciences, information science and environmental science. So Professor Ruth Mostern, she has many diverse interests and working on many different projects and she is author of two monographs, one is called "Dividing the Realm in Order to Govern, The Spatial Organization of the Song State," which was published by Harvard Asia Center in 2011 and her new monograph, "The Yellow River: A Natural and Unnatural History," was recently published by the Yale University, I think just last month or two months ago, right? So, she's here to talk about this new book with us. Alongside with these two monographs, she's writing multiple articles, she coauthors and co edited multiple volume with a focus on spatial history, digital humanity and also with a focus on gazetteers. So, I notice from her online profile, professor Ruth Mostern currently is doing a collaborative project funded by the National Endowment of

Humanities in order to create a world historical gazetteer that includes content and infrastructure of a spatial linked open data. So this is very exciting, so for today's talk, we will first hear professor Ruth Mostern to talk about her new book and I would like to have a short conversation with her to ask her to introduce her other projects and after that, our audience, you're welcome to use the Q&A function on the Zoom to send your comment, to share your comments and to put in your inquiries. So, I just want to remind you, we have also many audiences currently on YouTube watching the online stream, streaming of the event, but for those of you who are on YouTube, unfortunately you cannot send in your questions. So, if you have a friend, you have a colleague, so, if you really have inquiry or a comment, if you're on YouTube, you can ask your friends to send in comments on your behalf. Anyhow, this is a wonderful occasion to celebrate Ruth Mostern's second new book, beautiful book, I'm going to turn to you, Ruth, now.

- Well, thank you so much Ling for that kind introduction and let me share my screen. Okay, so, I'm grateful in general for, of course for Ling's kind introduction, and also especially honored to be part of this series that she invited me to because she's really one of the first people who I ever talked seriously with about "The Yellow River" and one of the small number of people with really without whom my new book would not exist, so I'm so delighted to be a part of this series that she's organizing and to be in conversation with her. So, I want to start with a little bit of a kind of, sort of intellectual autobiography of the new book and Ling mentioned my first book, "Dividing the Realm in Order to Govern, The Spatial Organization of the Song State," which came out about 10 years ago, came out exactly 10 years ago and "Dividing the Realm in Order to Govern" looked at those sort of Song political economy in order to understand why it was that local government units, prefectures and counties were establish or disestablished in different parts of the Song realm and identified the fact that these changes did not happen, they happened over time and space in ways that had sort of particular punctuated rhythms, that is they didn't happen sort of randomly or gradually, they happened in certain times, in certain places for certain regions. And soon after I published that book, I came to realize that I had missed a big piece of the environmental story. Both I had missed the fact that on the frontier between the Song regime and the Xi Xia regime, that the activities of founding new counties, new prefectures, new fortifications was causing a tremendous amount of erosion. And also the downstream on the Yellow River flood plain, this was a time, the Northern Song was a time of a tremendous and tumultuous and ultimately I came to understand newly severe amount of flooding as well as several major course changes. And I realized that at the margins of my first book, "Dividing the Realm," there was information about the significance of those course changes and those floods to the process of establishing and disestablishing local government units, but I didn't really understand that story. So, that's sort of the first

piece of the kind of the Genesis of my new book. The second piece was that as I started trying to understand what was happening in Yellow River history, I kept seeing this kind of phrase, this sort of stock phrase that said there were 1500 floods in Yellow River history and I'm like, well, that's specific, I mean, how do we know? Who knows why there are 1500 floods? Where they're really 1500 floods or is this just literally kind of a stereotype stock phrase? And I traced it back, I mean, I didn't do a sort of a full intellectual history and I would really be interested in a 20th century historian talking to me in more detail about this, but basically I figured out that there was a book published in the 1930s called "The Yellow River Annals, Huang He Nian Biao" by Shen Yi that seemed to have been the source of this 1500 floods and 30 major course changes kind of proposition and the Huang He Nian Biao is just a list, I mean, it's literally an annals, right? Year by year, where was there a flood? Where did some activity occur on the Yellow River? When did it happen and a link back to some primary source, and it's a physical book, it's a written book, this is of course long before digital systems were developed, but I developed a kind of quixotic idea, the crazy idea that it would be a good idea that as far as I could tell, people were still kind of saying this sort of 1500 floods and that nobody had really gone back, especially in the context of new digital methods to figure out whether that seemed about right or not. And so, I decided to start a new project that covered the entirety, all of the thousands of years of Yellow river history in order, as much as I had done methodologically in "Dividing the Realm" to start by creating a database and then to see how things were punctuated, how in time and space, we could tell the history of the Yellow River as a sequence of events and that project which I started almost 10 years ago, has now come to fruition with the publication of my new book. So, when I talk about the Yellow River, one of the things that I came to the conviction of really early on as I was working on this project was to understand the history of the river, not just as the history of its flood plain, but as the history of the entire watershed. And so, what you see here on this slide is exactly that, all of the area that you see colored in various shades of green and brown is the entirety of the Yellow River watershed, including on the east, the floodplain, which has comprised really of three sub plains, the three sub floodplains, the Yellow River, the Hai River, and The Huai River, together constitute this vast flood plain that lies on both sides of the Shantung Peninsula, and then upstream the large catchment zone from which all of the tributaries enter the Yellow River, starting on the Northern part of the Tibetan Plateau and centrally, as you can here, entraining the Loess Plateau. And so this is a region of very thick, less soil and I came to understand, and I'll talk about this more in just a minute that the history of the Yellow River is significantly tied, it's inextricable from the history of the Loess Plateau, because all of the sediment that over millions of years constituted the flood plain and that within historical time, is the history within which people and the river are entangled is the story of what happens to that sediment from the Loess Plateau through

which as you can see on this map, the Yellow River makes its characteristic great bend north east, and then south, again, basically I'm circumnavigating the central part of the Loess Plateau. Within its floodplain and within this large sort of continental region that takes up most of North China, the Yellow River over time has occupied many, many different courses, which you can see here as a variety of colored lines. Another way of putting this is that the Yellow River, like many rivers, is not best understood as a line that travels neatly through a course, but rather as an entire zone. The floodplain of the Yellow River is very flat indeed, historically, or I should say, perhaps prehistorically, much of this region was constituted by wetlands, shallow courses, which would easily fill with sediment and the river would then meander among one or multiple of its many courses to the sea. It's only during historical times and as we'll see in a minute, pretty late during historical times that it became interesting for people to lock the river into a single course. The river on its own would be occupying multiple of these historical courses simultaneously and changing course among them as sediment accumulates. So, as I said, the history of the Yellow River, the way that I have pursued it in this book is really significantly a history of this accumulating less sediment and the key thing to know about the less sediment as this quote on the corner of my slide here indicates is that Loess is very resistant to erosion under vegetation cover, but readily erodible without it. And so, as you can see in this sort of microscopic photograph of the composition of the soil on the upper right-hand part of my slide, one of the things that's significant about Loess soil is that it is comprised of grains of a variety of shapes and within those kind tiny particles of soil, therefore are voids between the soil. And that means that as long as there is ground cover, grasses trees, et cetera, covering over the soil, it's really permeable to water, it's great, it has fantastic drainage, that's one of the reasons why people practicing early agriculture, neolithic people found this such easy land to work. That also means that as soon as the ground cover is destroyed, the soil can very quickly become powdery and blow away and that's what these four, I call these my Loess selfies, these are taken near Zhengzhou, and that with just a tiny bit of manipulation, first of all, it conform very easily into hard clumps, it's an almost concrete level, hard material that was used for buildings, but also that unless it's sort of pounded into shapes, sort of locking in those interstitial voids between the particles, it also just easily becomes dust, it's very fine, it blows away, it makes its way into the watershed where it can, within which gravel and even boulders can become suspended, like a sort of a slurry, a kind of a mud slide under conditions of heavy water. And so that's the sort of the story of the environmental context, the ecological context within which the story of the Yellow River that I tell transpires. So, one of the other things that's important to note is that the history of the rate at which sediment from the Loess Plateau accumulates in the river has changed dramatically over time. And this is a graph, this basically runs, from the point of view of a historian runs from right to left

showing the amount of sediment accumulation and this is from soil cores in various places in the river, in tributaries, in lake beds and in the ocean, the coastal ocean, that 12,000 years ago, the amount of sediment that accumulated was about 0.2 centimeters per year, rose a little bit at the Holocene Climatic Optimum, which was a time of greater rainfall, but also therefore a time of greater vegetation growth and the era during which farming began on the Loess plateau. Rose again significantly during the neolithic and bronze age, so by the end of the bronze age, basically the rate had tripled over its pre anthropogenic rate, but was still quite low at that point before rising dramatically during the 2000, say 2,500 year Pre-Imperial and Imperial era as essentially of increasingly efficient iron technology and increasingly dense populations, and increasingly ambitious governments to a rate ultimately of approximately 1.6 centimeters per year of sediment deposition, also with years of low rainfall representing times of less sediment deposition. So, this is one way of telling the whole history, the whole story of the Yellow River is through the history of its soil as we can see from the work of soil scientists, right? Not historians working with historical sources, not even archeologists working at their timeframes, but the history of the soil itself as it has settled on other places within the flood plain. So what happened there? So again, one of the ways that this links back to my first book, one of the stories of my first book, "Dividing the Realm in Order to Govern" is about the fortification of the Song-Xi Xia border in my first book, focusing on the Northern Song and looking at this dramatic expansion in the number of settlements between the middle of the eighth century, which you can see there and figure a, the middle of the 11th century in figure b and the early 12th century in figure c. And so each of these, if you remember back to that first map of the Loess Plateau, I've included a version of one of those maps here and all of those settlements, all of those new frontier settlements, essentially, we're running across the Northern edge of the Ordos region, that sort of eco tone between semi-arid grasslands and desert. And that was the region that was contended between the Song and the Xi Xia people and also therefore was the region of dense fortification, and ultimately, right, and even at the time, people were starting to comment on the deforestation they were causing, the erosion that they were seeing, this was visible during historical times, during the Northern Song and ultimately transformed places that had been sort of grassland plateaus into dissected and heavily eroded territories like the ones that you see here up in the upper left, this is an area just south of the Yongding River, in what had been this intensive settlement zone. Right, and there, again, that star represents approximately the location of the image that you see there, that grasslands image and a contemporary image, just to sort of highlight the fact that once this erosion occurred on the Loess Plateau, once the Yellow River became the sediment laden body of water, that it transformed into over time and I'll show some timelines of that in just a second, that the problem of sediment becomes a problem that the people of the flood plain and the regimes that

controlled the flood plain had to manage as they do down to the present day, as you can see in this image. So, this is a map then of all of the floods that occurred, that were tested to have occurred, I should say, and now as I'm sort of talking through questions of evidence pivoting here towards the historical evidence, but also constitutes an important part of my project. So, from soil cores now into historical information accumulated together to become data, sort of in the spirit of this Huang He Nian Biao, this annal of the Yellow River, and you can see the floods fanning out across the whole flood plain as the flood plain itself, as the river itself occupies its many historical courses, with some of these, again, this is an archeological site, an excavation that is happening right now, around location, at the location of the Kaifeng City Wall and showing, documenting this dramatic rate of sediment accumulation over time and including, you can even see there right in the middle of that image, a sort of a slack water lake that formed at some point during one of the Qing Dynasty floods that pooled together in this many meters thick accumulation of Yellow River sediment. And then showing just kind of zooming in here, on all of the floods as they moved through the many courses of the river and entrained the city of Kaifeng at various times in history. So, now sort of moving out to the sort of macro scale of what can we tell through a story of the data about all these floods? So, one thing that we can see and what you see here is two pieces of information, one, the dotted line, the continuous dotted line is the moisture variance mean. So, this is how the amount of rainfall essentially has changed year by year, and then the white lines, the bars, are the floods that are tested around Kaifeng in historical sources. And so one of the things that you can see is that there is a very long era, essentially from earliest times and this goes back only to the fifth century, I have data as far back as people were writing about this, back to the warring states, a very long period that basically goes until the middle of the 10th century when very, very few floods were tested. A second period, roughly coinciding with the Northern Song, with that era of rapidly intensifying occupation on the Loess Plateau, a punctuation of flooding, very little attestation of floods during the Qing, but that doesn't mean that they weren't happening, that's something we might want to talk about in Q&A, the Qing just simply did not keep track of flooding, even though that was actually a very tumultuous time in river history, anomalously very intensive flooding during the Yuan and Ming, and then less flooding during the Qing and that's one of the things I'll be focusing on in a minute, because of course we think of the Qing correctly as a time of intensive scrutiny and intensive management of the Yellow River, but what this means actually is that it was a time of relatively successful flood control, up until it wasn't anymore, basically. So, this is essentially, I think in the interest of time, I'm going to pass over this relatively quickly, this is the entire set of event data that I have in my database, going back from warring states time to the end of the Imperial era, again, attesting the fact that it wasn't until the turn of the 10th century that there began to

be a significant rate of disaster and also, so that's one of the pieces of information here, another is that the disasters that I have coded in my database as Breaches of Levees, right? Also only became a higher ratio of all the disasters over time. And basically, that's a sort of roundabout way of saying that high water and course changes and sediment deposition only becomes something that counts to people as being a disaster at the point that they are engaging in civil engineering around it, they're engaging in activity, they are building levees in order to support the existence of dense populations and cities and agriculture. And that's one of the other things that without going into all the details, that you can see here in these images. And so, that's all on the sort of the top image here, the bottom image then is about the percentage of events of management, events of engineering on the flood plain that were depicted as repairs rather than other kinds of waterworks management. And so again, sort of focusing in on this idea that essentially once people start building massive amounts of waterworks engineering, it creates a new kind of regime, of culture, of spending and of relationships to the river. And this is just again focusing on that sort of late ninth century, early 10th century moment, where there was this pivot in people's relationship to the river and in the amount of flooding that was being reported. And then here, this sort of era, this high Qing era of successful water management. So, another way we can look at this is, right. So, what I want to focus on now briefly is what happened during that high Qing era of successful water management. So, basically until the 17th century, well, basically until the Ming-Qing transition, the rate at which river disasters were tested in historical sources and the rate at which events of water engineering were tested tracked very closely to one another and that's what you can see here, basically in this white line and this black line on the table I'm showing you, then right around the founding of the Qing, you could see that that switches place, the number of events of management increased dramatically, the number of events of disaster decreased dramatically, reaching an extraordinary peak at the beginning of the 19th century before then switching place once again. And so, this is one way of doing long-term history, I think, I'm talking about the Yellow River here, but I'm also talking about those sort of historical methodology more generally, that we can tell a story of the relationship between people and the river by tracking these interesting moments when this ratio of problems that people saw and of solutions that they were implementing changed in various directions at the very long term. This is also a way, right? Of being able to say, we can literally pinpoint using information like this when it was that the Yellow River started to seem like a peril and a problem and also thinking maybe historiographically about the fact that I think it's often the case that both in Anglophone literature and in Sinophone literature, that the Yellow River is kind of portrayed or seen as having been an intractable problem since time in memorial as it were. And I think that's really looking back in time at something that didn't really begin to be the case until well into the 19th century,

and that's another thing that I think is visible from this kind of long-term and data analytical work. I think I'm going to speed up a little bit, 'cause I want to make sure that we have time for Q&A and discussion. So, what was it that was happening during the Qing dynasty? Why did this very lengthy idea of sort of letting the river kind of subsist with a certain amount of disastrousness in this sort of post 10th century environment, right? What changed gradually during the Ming and then very rapidly during the Qing? And the answer is basically the Grand Canal, that the course of the Yellow River transect the Grand Canal near Hongze Lake, for reasons of geopolitics, reasons of transportation and politically economy, it ended up seeming to the regime like it was absolutely essential, like all Yellow River management had to be oriented toward ensuring that the Grand Canal was always passable. And so, what you see here in this set of six maps is the sort of history of geo-coded events of both disaster and management around Hongze Lake, the historical course of the river, which was throughout this era from the 13th to the 19th century, was always north of Hongze Lake, and a series of events starting with the founding of the Ming and ending with the change of course of the Yellow River in the mid 19th century, ultimately this intensive management of the river, the dark gray events are events of management, the white circles are events of disaster and what you can see here essentially is a transition, first to more and more disaster and ultimately, towards this high Qing, the sort of long 18th century period of intensive management of the region around Hongze Lake and the Yellow River. Which also can look like this, and this is not something that's in my database, this is something that comes from maps that other people have created, basically taking what had at one time, in the sort of the early Ming that the Yuan had been a very simple kind of intersection between the Grand Canal and the Yellow River, ultimately became this intensively engineered location. And yeah, well, I guess I'll leave it at that, I have another image I'll show that's related to this in a minute, right? And then here just kind of zeroing in again on this moment I was talking about, this is just really the same data I was talking about, but here, looking at that kind of dramatic and really historically anomalous, there is just this one period, this one period of really just the greater 18th century the long 2,000 year plus history of recorded Yellow River history, there is only this one century when the amount of intensive human activity, intensive engineering on the river was adequate to just drive down the rate of disasters and was actually successful. And that's another point, is that it actually, one of the things that this history tells is the fact that it actually is possible by devoting enough engineering and enough money to depress the rate of disasters, thus keeping the Grand Canal open and passable for a really long time, I mean, for that one long century when it became essential for that to be the case. We talked about this before, and this then is just another, this is a 19th, maybe 18th century map of that confluence between the Grand Canal, the Yellow River, the Huai River and Hongze lake and this is basically, this is one of the maps from which the

diagram I showed you earlier was taken. And the point I wanna make here, right? What I've really been stressing throughout this talk is the idea that floods, right? And this 1942, American engineer, that floods are so-called "acts of God," but flood losses are largely acts of man. It's only once a highly engineered system like this occurs, like once the entire sort of political and economic structure of the empire depends on ensuring that floods don't shut down the Grand Canal, that disasters become disastrous, and that spending activities have to focus on making sure that floods don't occur in a disastrous way. And so again, the intensive management began in the 18th century, ended in the middle of the 19th century. And one last thing I want to focus on here with this slide is also the idea of sacrifice zones. And so you can see here, this image I took traveling around Hongze lake, this is sort of the Southwestern corner of Hongze lake, traveling around the lake and seeing this same sort of barrier, the stone wall that you can also see represented in the map, which is where high water was supposed to disgorge on to wetlands, ultimately onto people's homes and fields, away from the canal rather than into the canal itself. It's not that the amount of sediment flowing into the river changed, it's not the amount of water that was coursing through the Yellow River system changed when water was high, it was an explicit decision about where to direct that sediment, where to direct that water and the explicit and intentional creation of certain places as sacrifice zones. I'm just about done here, I just wanted, I know I've been making a lot of propositions and assertions that are based on data and that are methodological, this is something that I don't want to spend too much time on now, but I would be happy to talk about in the Q&A, by Upper Course, my Loess Plateau data is basically sort of geo-coded and restructured based on the historical Atlas of China and the Chinese Historical GIS and the Lower Course information from publications like "The Yellow River Annals," in fact, after all of that, I started out my talk saying that Shen Yi had proposed that there were 1500 floods on the Yellow River, floods and 30 course changes, indeed, that is almost exactly what I came up with. So, that was a lot of work to reaffirm what he discovered, although I've sort of split and merged data, I can talk more about that in a total of 3,754 events in my event database that I can then query and create assertions and timelines and maps like the ones that you've seen here. So this is, again, as, Ling mentioned, this is a talk that's based on my newly published book, here's the information about that book and I want to really make sure, and this is something also I'd be honored, delighted to talk about in Q&A, this was a really, really, really collaborative project. I had so many collaborators and students over the years who helped me with this data work, who helped me with database design, database queries, cartography and I really want to make so sure to honor and acknowledge all of those individuals. So, I will leave it at that, I'll have a conversation with Ling and then we'll take it from there. So, thank you so much.

- Thank you, Ruth, and this is a fantastic introduction to your book,

and I wanted to emphasize this issue at this point, this is not only a very rich, informative, insightful book, but it's a beautiful book, I have a copy at home, since I'm traveling, so, I don't have the physical book with me, but I read it, it's so beautiful, it's such a pleasure to hold it in hand, so, I highly encourage everybody to get a copy, you can ask your library to acquire a copy from Yale University Press, it's a wonderful publication, all work is fantastic. So, I just want to quickly before we turn to Q&A, so here, I encourage our participants, our audiences to send in your comments, your inquiry, anything you can think of through the Q&A function on the Zoom, because you cannot really see other's questions and comments, so at the end, I will collate all your comments and a questions, I will read them out one by one, and hopefully we have enough time to cover all of them. But before we move there, I would like to quickly mention this, Ruth, congratulations on publishing this beautiful book, but as I'm looking back a few years, back the time when we were talking about your project, and then we were talking about my project and I would like to just say how amazing actually the past few years was such a golden time for Yellow River studies, right? We're having your book and if we look back to 2014, we have Professor Micah Muscolino's book, "The Ecological War in China," which was published by Cambridge University Press and then I think a year later, we have a wonderful book, "The Yellow River," written by professor David Pietz from the University of Arizona and then two years, no another year later, 2016, I published in my book also on Yellow River, which was from Cambridge University press. So, now we have all of these amazing collection of Yellow River studies together in English available for our readers, our audience. Sometimes, I jokingly tell my friends and colleagues, half jokingly and half seriously, we can literally design syllabus and teach undergrad level and graduate level courses based on this vast body, let's say, of Yellow River scholarship, but let me put it this way, every book has its own unique emphasis, a different strength and unique constraints and, for instance, if I talk about my own book, it focused on a certain relatively short amount of a time, during the Song period, and also in terms of spatial coverage, it only focused on the lower regions, the flood plain of the Yellow River. Micah's book focus on 20th century Republican era, David's book covers a vast period of time, but the focus was really about modern China and each of us have a thematical, methodological differences. And your book is very ambitious, it covers thousands of years of the period of time and you also made a strong case that you are looking at Yellow River for the entire watershed, not just a segment, geographical segment of the watershed. So, this kind of approach, this kind of ambition, you did so well to demonstrate in the book, it gave you this opportunity, but I believe also introduced a lot of the problems and challenges during this time that you conducted research. So, I think this will be wonderful opportunity, actually, you can talk to all of us, especially I noticed many graduate students are actually here in audience, can you talk a little bit about what kind of challenges that you faced, you dealt with, how you dealt with them and especially you uniquely

use a spatial analysis, used digital tools, right? Use a spatial and geographical information system to cope with the many of the challenges. Can you say something about that, including, especially your own approaches, your ways of coping with challenges?

- Yeah, sure. One of the things that is sort of a nagging problem with doing this kind of multidisciplinary work, that includes data analysis, readings of environmental science and archeological literature and also though I didn't talk about it too much in this presentation, of course also the core historians craft of reading and interpreting written documents, and moving back and forth between those scales and between those types of analysis is always difficult. And the thing that I started out this book wanting to prove, prove maybe I'll sort of put in quotes, was that the sedimentation, the erosion on the upper course of the river caused the flooding on the floodplain, right? And that there would be this sort of neat and linear kind of trail of causation that started with human settlement and exploitation of the Loess plateau led from there to rising rates of erosion, led from there to rising rates of flooding and led from there to a higher rates of disaster. But of course, things are messier than that, once you zoom out to a 3,000 year timeframe, causation kind of drops away and all you have is correlation, right? And so, I can see when it was that the population and exploitation of the Loess Plateau increased, I can see when it was that erosion increased and I can see when it was that people started writing more about the flood plain, but I can't quite see, it's just not quite visible in the big datasets that any of those things actually caused the other as opposed to just kind of correlating together in time. And so one of the things that I was really looking hard for in the written sources was people at the time who said, okay, we can see that there's more erosion or okay, we understand that the reason why the Yellow River has become more prone to floods is because of something that's happening hundreds of miles away. And I found that occasionally, but I didn't really, and whenever I found those instances, I tried to really just sort of latch on to them and use them as well as I could, but of course, people don't write with historians, future historians, a thousand years later in mind, they write with their interests in mind and they weren't particularly interested in making these connections so part of it is because of something that ecologists referred to as shifting baseline theory, right? The idea that within a human lifespan, within maybe even less than a human lifespan, whatever people are experiencing seems normal to them at the time, right? We have this in the contemporary world as we experience climate change, pollution, species extinctions and et cetera, whatever we experience is our normal and that was certainly true for people in the historical past as well. And then also just because on the instances, sort of now and again, through the hundreds of years, through the millennia, when people said, when historical actors said, I think the reason why there's so much sediment in the Yellow River on the flood plain is because of erosion that's happening further upstream. People did say that

periodically, but it was not really within the realm of political possibility for anyone to act on that information. It's not like people could just change a policy regime altogether. So, excuse me. So, of course I faced challenges of working with data, we can certainly talk about that, but, excuse me, but also just in terms of thinking about how to tell a convincing historical story, that isn't just look at all this stuff I can put in front of you.

- Thank you so much, yeah. I for one have learned a lot from the methodological approach that you innovated in this book. So, I don't want to take up too much time. I do have many things I want to talk to you about, but we can leave them to our future encounters. So, there are actually many questions and comments coming in through the Q&A. So, in the next about a 48 minutes we have, no, not 48, we have about 38 minutes left for this conversation. So, we will dedicate the rest of the time to the Q&A, so, Ruth, just again, to go through the list and read them out to one by one and feel free to, yeah, I'm just going to read them one by one. So, first one, we've already answered. Okay, so the first question comes from Katherine Moore from McGill University. Catherine asks, how is the climate change affecting Yellow River and the people's health? So you kind of answered the first part, but people's health, so.

- Right, and this is a book, my book ends, kind of ends at 1911 and that's intentional both because the base of sources changes so much at that point and because of David Pietz's wonderful book about the 20th century Yellow River and also because the sort of the industrial regime of modernity, sort of heavy industrial ways of managing the river are so different than the historical ways of managing the river. So, all of that is to say that I am not really focused on 21st century, 20th and 21st century climate change and river management and health, although that's certainly something I'm interested in and of course now, the sort of ironic kind of end of the story as it were of the Yellow River is that now the problem is that so much of it has been redirected for irrigation, that the river does not even consistently make its way to the ocean anymore and so, it's a new problem of catastrophic dust storms and water scarcity rather than flooding. But to pivot back to the historical era, one of the things I talked briefly towards the end of my comments about the intentional creation of sacrifice zones, right? And the idea that this sort of high Qing, long 18th century successful management of floods on the Yellow River, successfully doing so much building of levees and sluice gates and dams and reservoirs, great drainage canals and so on, that went along with identifying some people, some places, some kinds of activity that would be sacrificed. And one of the things that that meant is that in those locations, alongside the levees that developed very poor drainage because the natural tributaries had been extinguished, wetlands grew up, they became highly saline, parasitical insects moved into those areas, the productivity of agriculture fell dramatically and the rate at which people acquired waterborne diseases

increased. And so, in a sense, I mean, my sort of bird's-eye, my big story about the history of the Yellow River is what it looked like not only for the whole watershed, but therefore from the point of view of the regime, but absolutely on the flood plain, this went along with high levels of disease, decreasing agricultural productivity, decreasing access to firewood and reeds, sort of water growing reeds that were used as building materials, all of which flowed to the state rather than to the individuals who needed them and therefore just caused a high level of misery. And there's also evidence going back at least to the Song of the fact that when people were kind of forced into corvee labor, that is the labor service that people owed as part of their obligations to the state or when soldiers were forced into river duties, so both through soldiers and through this corvee labor labor system, people had to labor on the river and that was horrific work. The rate of death and injury and just overall misery was really, really high and there are lots of stories about people trying to buy their way out of that service, escape from that service and so the life of people on and around the river was really, really bad as also on the Loess Plateau, there's also evidence going all the way back to the Song, actually going all the way back to the Yuan we have information of settlers and soldiers who were sort of forced to move into those frontier locations and did their best to escape, right? These were places that were, I mean, the reason they were frontiers is because they were so very marginal for agriculture, and yet people were compelled to perform agriculture in these remote and distant places and did so under tremendous misery. So, I really appreciate this question that kind of asks us to focus on what this history means at the level of individuals and their wellbeing.

- And I want to add a one line, so Catherine, if you are interested in, there's a lake chain transformation and impact on human lives that Ruth had just talked about, you may also like to check out Kenneth Pomeranz book, "The Making of a Hinterland" in which he talks a lot about that and you may like also to check out a Chinese book written by Professor Ma Junya at Nanjing University, it's called the Bei Xi Sheng De Ju Bu "The Sector of the Empire which was the Sacrificed." So, he talks a lot about the human suffering and health issues there. Okay, let's move on to the next question. So, there are a lot of questions coming in actually, so, very quickly, actually, Ruth, would you like to share the slide with your book again? Somebody would like, Lookwood Young mentioned

- Sure, okay, let me just share screen again for a minute. Here we are.

- And actually, as you are doing that, I'm going to read out very quickly, Steve Harold's question, because he said he's leaving at 5p.m, that means we have two minutes to talk.

- Okay, here, can you all see this as this? Is this the slide you're

looking for?

- I believe that's it. So Steve says, Ruth this is wonderful, looking forward to reading the book, very quick question, and then I'm not sure if Steve is still here. One reads distressed quotations from Qing officials about population pressure and the results that people were actually forming and living within the outer dikes, how did this relate to concerns about the canal? Was it effective in their management decisions?

- Yeah, yeah, thanks for that question, that's something I really have spent time thinking about. So, just as a sort of a kind of a background on this topic. So, during this as well, off and on, starting in the late 15th century, so starting in the Ming, the one of the ways to manage the flood plain around the Grand Canal was to build two sets of dykes. It was an inner set of dykes that straightened the river's course and narrowed it, right? And you can sort of understand the physics of this, you take all of the water, you squeeze it in and you narrow it, right? And that causes the current to speed up dramatically, right? The river can no longer meander, it can no longer move even a little bit around the flood plain and so it's zooms past the canal and so there was double diking around the canal, and I could show you this on that Hongze Lake map that I had in one of my slides, a couple of my slides, but basically, this inner dike that was intended basically to serve the purpose of scouring out the silt from the river, pushing it downstream past the canal. And I'll say that that created one kind of sacrifice zone because it's not like the sediment that was pushed past the Grand Canal cease to exist anymore, it just means that it wasn't in the canal itself and so, what that did in sort of the first, to the kind of initial kind of experiments with this method, which were performed by a Ming official named Pan Jixun was to radically and rapidly increase the rate of sediment accumulation on the delta to create just sort of this vast mudflat at the mouth of the Yellow River and ultimately, that caused the water to sort of backwash back up the river again, the engineering had to be modified, but basically in a way it was more or less successful, it did in fact, this sort of narrow diking, did in fact push the sediment past the confluence between the Yellow River and the Grand Canal, but at the expense of basically turning every place downstream the canal into one of these sort of sacrificed zone territories, this area that became so inundated with sediment and salty water, brackish water, that it became impossible to farm. So, that's the narrow diking, but the purpose of those narrowed dikes wasn't flood prevention, it was changing the river current. And so, then some kilometers away, like maybe five or so kilometers away from the inner dikes was another set of outer dikes. And that was the area within which the sort of the implicit promise, the social contract of the state was that this is where we will try to prevent flooding from happening. And people were forbidden from living and farming between the inner dikes and the outer dikes. But of course they did, of course they did, right? There

was land scarcity and so people, right, and of course it was often very fertile between the inner and the outer dikes, although it became brackish over time, and so people moved into the region between the outer dikes and the inner dikes and always with just kind of, I guess, I'll say, I mean, other than the fact that this happened, the state never succeeded in preventing it, I don't think they really tried that hard to prevent it, honestly, right? But it's just an interesting kind of push and pull of land use and urgency, right? And something I think about often, I mean, in the contemporary world with, right? Questions of flood risk, disaster risk and the real kind of, sort of ambiguity and kind of mixed feelings that governments in the contemporary world insurance agencies have to risk-taking, right? On the one hand, it's not that the people moving into these sort of forbidden but tantalizing lands between the inner and outer dikes didn't know what risks they were taking, of course they did, but the hope is that this year's flood or this decade's flood or the flood that's going to wipe out everyone for dozens of miles along some stretch of this land isn't going to happen to me or in my lifetime or in my family, right? And it's somehow becomes a risk that people are willing to take. And I think, for any kind of environmental history project, in any kind of disaster history project, thinking of it in terms of the sort of what risks do people find manageable? What kinds of risks are people willing to take is one really useful approach, I think in our COVID era, we can all feel that, right? Anytime we decide how big a crowd are we willing to go out into? Do we feel like we need to wear a mask in this situation or that situation, right? We're making judgments about risk as the people who lived between those inner and outer dikes and then hope for the best.

- Great answer, Ruth, I really hate to do this to your Ruth but I am going to ask you to keep your answers concise, because I want you to go through all these questions. We have a many question coming in and they're really great. So, let's try to cover all of that. So, the next question is from Prasenjit Duara from Duke University, so Prasenjit asks, question one, is there a row of the early climate change? Question two, so you choose, if we have time, question two, Pierre-Etienne Will suggests that there are three phases, including phase two of a heavy infrastructure that leads to more powder levees, et cetera, which leads to phase three of inundation. So, does engineering produce new consequences and problems?

- Sure, let me first take the question about climate change and then maybe I'll want you to prompt me again about the details of Pierre-Etienne Will question, if I'm not remembering them. So, climate change, right? So, one of the data sources that I've been really lucky to be able to work with is the Monsoon Asia Drought Atlas, which goes back to about the sixth century and so from that, we can see when there times that are more moist in history, when there's times that are more arid in history, I'll say it again, since Ling has asked me to keep it brief, what I will say is that rainfall, the amount of

rainfall that occurred in any given year seems not to have had a direct relationship to the amount of flooding that occurred in that year since also the engineering that was occurring had so much to do, right? Just luck and engineering essentially had so much to do with any individual instance of when and where a flood happened. The place where climate makes a huge difference is actually on the Loess Plateau where the moisture gradient of the Loess Plateau from the sort of the Southern part around the Qinling Mountains, up to the Northern part around the Gobi desert, pretty much every kilometer also made a difference in less and less moisture and also in the likelihood in any given year that the moisture from the monsoon would reach that location. And so the way that climate change makes a huge difference in the history that I'm telling in this book is the ability to build and sustain agrarian settlements or any kind of fortified out post on the Loess Plateau, the ability for farmers to live densely on the Loess plateau and the likelihood of conflict and friction and different kinds of interchange between pastoralist and agrarianist modes of subsistence. So, there's a very significant climate change story here, and some sort of dramatic moments, especially in the Ming, where climate change made a huge difference, but less for the flooding part of the story and more for the upstream colonization part of the story.

- I think I'm gonna remind you of the second question.

- Sure.

- So, wells thesis are three phases, hydrological cycle, and the second phase, a firm building infrastructure, would it lead to the third phase of inundation? So the question is, does engineering that you talked about produce new consequences and problems.

- Right, so, yeah, so basically, I don't want to say, there was some engineering that preceded floods, especially if we go sort of all the way back to the warring states era, back through archeological evidence, even further into the neolithic, we can see that people were creating ponds and levees and ways of sort of separating water and wetlands at very, very early times. And so there's essentially, and I guess I sort of said this in my talk that high water doesn't count as a disaster until people create situations that cause it to be disastrous. So, when you have widespread wetlands and no construction, water can rise and fall, the river course can change and it doesn't even necessarily get recorded in the historical sources. And so, I think the way, I mean, I can periodize the big history of the large scale of centuries and millennia that basically sort of keep it brief, there's kind of the pre 10th century low disaster era and the post 10th century high disaster era. But then among the sort of the shorter term cycles, I think the way I would periodize it is, first there's construction, then there are rising rates of events attested as being disastrous, then there's more construction and then ultimately,

there's some systemic rupture and then things sort of start over again in some way. And maybe I'll just add one short, more couple of sentences, which is that one thing I didn't do in my talk for today, but that I talk about in the book is sort of contrasting the Ming and the Qing, the Ming also of course was a regime that cared about the Grand Canal, but decided not to engage until pretty late in the era in intensive engineering on the Yellow River. And so what that meant is that rather than the canal sort of functioning as kind of one line that barges, could transect from one end to the other, from, from Hong Kong to Beijing, it was basically a series of kind of offloading and on loading onto lakes and wetlands and natural tributaries and small bits of canal, basically, that's something that goes from the Sui through the Ming was sort of, kind of a coexistence of a natural ish, maybe a semi-cause natural kind of wetlands network with these other kinds of transportation imperatives. And so what happened in the Qing was really something quite different from that for the first time.

- Thank you, all right, let's look at another set of questions, so, there are two questions, they're coming from Eric Lee, who says, thank you Professor Mostern for this wonderful presentation, I have two questions. First, I'm curious if the fall of the Yuan dynasty had contributed in any way to this a heightened sense of a consequence of environmental disaster. Okay, the role of the Yuan dynasty and the fall of the Yuan dynasty. Second, I remember hearing from Benjamin Elman, a couple of years ago, that there are policy questions on this civil service examination regarding hydraulics in the late imperial era, by any chance, do you see any correlation between the appearance of such questions that intensified hydrological construction during late imperial times?

- Yeah, yeah, let me answer the second question first because that's easy, yes, absolutely. I mean, one of the things that happened, really starting in, kind of straight on through the late Ming, there were people who were interested in hydraulics, people who wrote books about hydraulic engineering, but there weren't really people whose careers in the civil service were really as river experts. That is absolutely a Qing, kind of a late Ming, but really a Qing kind of career path that people could really orient themselves for the entirety of their career toward the river. So, I haven't studied civil service exam questions as part of my project, but it makes complete sense to me that the Qing is when you would see civil service exam questions that focus on hydraulic engineering that goes with what I can see in people's career arcs and the idea of being a technical expert on river engineering. In terms of the Yuan, yes, I think actually I would put the causality, I mean, again, briefly simplifying what's in the book, I would briefly put it in the other direction, which is that actually kind of surprisingly, sort of counter-intuitively, the first proposals for a highly engineered Grand Canal interacting with a highly engineered Yellow River, actually date from the late Ming, sorry, from the late Yuan, from a time when you wouldn't think that that regime

had the sort of capacity to kind of envision much less implement something like that. But basically one of the very late sort of last couple of decades of the Yuan kind of propositions for how to stay in power was to kind of propose and sort of take early steps towards implementing this kind of engineered and co engineered system of the river and the canal. And so at which then absolutely ended in disaster, but I mean, in Yellow River disaster and also in regime disaster and was something that the Ming then stepped back from for really a couple of centuries and I don't, I mean, it would be interesting to look into how Ming hydrologists and hydro engineers kind of thought back on the Yuan experience and how they interpreted it, which is a sort of a piece of the intellectual history of the river that I haven't done, but it was a really great suggestion.

- Fantastic, okay, our next question is from our friend, Chen Yuan from Yale University, Chen Yuan says thank you for your wonderful and informative talk, I would say your book is a timely publication as it has a tremendous contemporary significance. This year, the Yellow River floods, again, hit various provinces in China, many blame the tragedies on climate change, but some think these are largely human disasters. So, what do you think from of historical perspective? So what do you think the modern policymakers, that's very important, can learn from your book?

- Right and thank you for a great question and I know I said a few minutes ago that the ironic problem of the Yellow River today is not even always reaching the sea and of course, I was not thinking about the tragic loss of lives in the floods this past summer, especially around Zhengzhou, so thank you so much for that question and for reminding me that that is the sort of the most recent story of the Yellow River is once again a story of catastrophic flooding and you know, all natural disasters, right? There's no such thing as a natural disaster at some level, this is one of the things I tell my students also, right? Disasters are always what people say are disasters and so one of the things that we can expect in the time of contemporary climate change is that they're going to be larger, unpredictable storms, this is definitely something that people engineer around and one of the things, and I'm starting to sort of look for examples of this around the world, like, I just read a remarkable article about Holland, where one of the responses to sea level rise, kind of counter-intuitively, ironically, isn't to build more pumps and more levies and more drainage, but exactly the opposite, to identify places that can't be protected by engineering or that can't be predictably always fixed by larger amounts of human intervention and instead, where those are being restored to wetlands and are becoming regions where water will be allowed and encouraged to pool when water is high, recreating ecosystems for birds and marshlands and migratory birds. And this is also starting to happen in California, taking down dams, rebuilding wetlands, unbuilding levies and in terms of, I mean, the way that I interpret the Ming and Qing history that I just briefly

summarized, that I talk about in my book, with the Ming approach was okay, let's have transportation, that's a little slower, a little more inefficient, a little more expensive, but maintain a bunch of this hydrology in the form of wetlands versus the Qing case, which really worked for over a century, but was very, very expensive and always risked the most catastrophic of disasters, which ultimately occurred, which was to try to out engineer nature. And if I could get the ear of a policymaker today, either on the yellow river or really any of the world's great rivers, I would say, let's give more of this watershed back to nature, let's give more of the floodplain back to nature, it's going to ultimately be better for people as well as the other living beings with whom we share this planet if we can make our human activity a little bit more inefficient, expensive and do it in fewer areas.

- Thank you for your wonderful answer and I wanted to bring up one person, actually, Ding Xiangli who is here in the audience at your talk, Xiangli is writing his book, which is a related, part of his book is related to wetland conservation and restoration, specifically relate to Yellow River, so, whoever's interested in this issue, you should check out Xiangli's work, so, Xiangli is teaching at Rhode Island School for Design, so check out his work. Let's move on to the next question, we still have very many wonderful questions, I want us to cover them. So, the next one is from Yung-chang Tung, thank you very much for this fascinating talk, are there differences in the nature of the data from different dynasties? Did you see any difference between the Qing and a previous dynasties in terms of collecting data and the recording events by Yellow River?

- Yeah, right, and this takes me back to Ling's first question, which is, what are the difficulties that I've encountered? What are the things I'm sort of nervous about and concerned about in my work? And absolutely, one of them is data quality and the concern that I'm sort of bringing just kind of artifacts of data into my historical analysis and the place where I know 100% that that's the case is in the difference between the data in the Northern Song and the Qing and basically even the place where that's most clear is the Yuan, prior to reunification of the north and the south and the Yuan after reunification of the north and the south and basically the data collection just disappears when people are on the flood plain, that is, right? The recording disasters and management events just disappears when the north and the south are separated from one another, right? Because essentially, I mean, as I've been stressing, the history of the Yellow River flood plain, at least in later Imperial times is really a history of canal transportation. So, when there isn't canal transportation between north and south, the quality of the data collection is also lower. But in general, I mean, for various reasons, I think that the, and of course, for the earlier time period, the sort of the first millennium of history, the fact that there isn't much attested history of management events and disaster

events, I think is at least partially an artifact of the data, but I think not entirely, not mostly, I would even say partly because within one regime, right? When things change mid regime, as they did during the Tang, for instance, that is captured in the way that people talk about history and also because sort of long kind of synthetic and multisensory historical works like the Shui Jing Zhu, right? From the, when is it? I think from the fifth, sixth century, right? Which sort of is a whole book about waterways, doesn't talk about the Yellow River as being a place of disaster, a place full of sediment, a place where there is a lot of engineering and so on. So, in general, I mean, there are absolutely artifacts of data, ways that data collection changed over time, but I'm fairly inclined with a couple of exceptions to think that that reflect real changes in the way people were relating to the river and not just changes in how record keeping was happening.

- Okay, now there is one question, actually, a set of a question from someone I really would like us to get to, this is a scholar whose work I've been following. So, this is from my at Michael Storozum at Newcastle University, geo archeological research, which I've been relying on for quite a few years. So Michael says here, I've been doing geo archeological research on some of these historical Yellow River floods and I'm very interested in learning more about your database, again, database. I'm curious to learn about how you have cross referenced these geo-coded flooding events in your database with published archeological reports, sedimentary outcrops, and course that have been radiocarbon dated. Is there much correspondence between these sedimentary record and the historical record?

- Great and thank you so much for this question and Michael, you're one of the people I have learned so much from also in the course of my research, so, so good to see you out there. So, the quick answer to your question is that I have not done that, the reports of sedimentary cores that I have are relatively small. So, I've kind of, well, there's a really small one that's just maybe 50 cores that I have integrated into my database, then there's the larger one that I showed, where I have the image, but not the data itself, which I would love to integrate and haven't yet. Creating my dataset just from the historical data was a huge, huge task and I did it starting with these published books like "The Yellow River Annals" and a total of, like 70 tables and lists and about 10 books and all of those are based on the historical data. One of the things that is that I am really, really eager to do within the next year or so is to publicly expose my data and I hope that it will be used by many people to do many other kinds of projects and one of the things that I would love to do myself or to see somebody else do with it is exactly the work that you're asking about here, but I myself have not done it yet and I would love to see how that changes some of my interpretations.

- Ruth, that would be an amazing contribution to multiple scholarly

fields, so, please do that. All right, so we have precious five minutes left, but we have a three questions to go through, so I'm just gonna, let's keep your answers short, maybe. So, first question, so, from TK True, who actually sent over two questions, but we're just get pick up a one, how about the second, would you please elaborate a bit on your very interesting remark on, "something is happening to the river because something is happening hundreds of miles downstream?"

- Oh yes, I think when I said that, I think that was, and of course I'm speaking extemporaneously here, but if I remember, when I said that phrase, it was where I was sort of thinking about what people at the time who were experiencing these changes in the river were thinking about and whether or not historical actors were recognizing that there were increasing rates of sedimentation and if so, if they recognized where that sediment was coming from, and very briefly, what I'll say is going all the way back, literally all the way back to the late warring states in the Yuan, I have instances of historical writers who weren't 100% clear that the sediment on the floodplain on the Yellow River came from the Loess Plateau and that human activity on the Loess Plateau caused sediment to increase, the problem was sort of translating that into public policy. But the idea that people on the flood plain knew was happening on the Loess plateau is clear, there are individuals going back to the Northern Song, prominent individuals whose careers took them back and forth between the Loess plateau and the flood plain, who were aware that there was a relationship between these parts of the river, there maps and texts about the entire Yellow River as a watershed going back to the warring states, back to the Han, so, the idea that this was a complex ecological system is something that people were aware about and just didn't quite translate into public policy.

- Okay, great, wonderful. Next question from Huiling Xu, says, hi, Ruth, fantastic talk, thank you, I have a question regarding the river management approaches. There were basically two kinds of approaches on Yellow River. One is a channel expansion and the other is a channel contraction, , how do you look at a different consequences caused by the adoption of the two approaches?

- Right and this is something I think a few minutes ago, I think in response to Steve Harold's question, right? I was talking about something that I sort of very roughly kind of caricatured as a sort of a Ming versus Qing approach, although these two approaches absolutely go much, much, much further back in time than that, I think they're both attested as far back as the Yuan, and so absolutely right, this sort of river management is always kind of a sort of a push and pull between you can strip the river, speed up the current, cause the water of the current to scour out the sediment and therefore permit more human activity, but at the risk of more likelihood of disaster or more likelihood of catastrophic disaster and much higher expenses, or do you let the river spread out to some extent, at least to some extent

in which case you don't have to spend as much, the disasters are more frequent, but less catastrophic, but the amount of land and activity that humans can predictably turn to their own activity is therefore less. And basically, one way of thinking about the whole 2,000 year history of the Imperial policy disputation about the river is the push and pull between these two approaches, each of which is legitimate, makes sense, has historical precedent and just leads to very, very different kinds of policymaking.

- Great, all right, Ruth, I think if you don't mind, we will extend just for a couple of minutes in order to accommodate, actually to look at this important question for our friend, Peter Perdue at Yale university. So Peter says Ruth, you said that following the shifting baseline theory, local people and officials on Yellow River had a short historical timeframe. Some of us are looking at the Yangtze River have found that aesthetic values of the Yangtze Lakes generated ideals of a beauty, expressed in Tang times at a promoted efforts to restore lakes in the Qing dynasty. Can you say something about the aesthetic values of the river and the landscape in the north and its effects on river control?

- That is a really interesting question that I have not ever explicitly thought about and I would love you know, Yuan Chen or somebody, if there's an art historian out there, I would love to talk more about this, but my sense is that there's very, very little aesthetic writing about the Yellow River throughout its long history, right? Certainly compared with the rivers and waterways of the south and that even before the Yellow River was a problem, it was not ever a space that was sort of kind of aesthetically construed as a space of lyric beauty, it was not a place that people were writing poetry about or painting landscape paintings about to the extent that I can think about artwork associated with the Yellow River, it's like paintings of emperors going to visit the river, to conduct the fun and shrine sacrifices, that is, that it was always a place where the art and the poetry was deeply associated with hydrology and management and state power and not with the inherent beauty of the river. It's associated for instance, with the wetlands of the Shui Hu Zhuan, which were of course about, fears about places being beyond state control, being hard to manage, right? Being outside the constraints of state power and so this idea of a river that was ever just beautiful because it was beautiful or a landscape that was a place of landscape beauty, I think I would love to hear someone else communicate to me about this, if someone knows more about this, please contact me, but I don't think the Yellow River was ever that kind of river where management decisions and policymaking had to take into account this sort of, kind of tradition of beauty and appreciation and kind of recreation.

- This is actually a very interesting question and I happened to look at the list of our participants, our attendants, one of our friends and a previous speaker for our series, artists is here, Michael

Churney who lives in Beijing and who dived in to participate in this event in this early hour. So Michael Michael Churney is a photographer using photographic techniques to recreate and also create traditional Chinese landscape painting style of photography. So he recently has done several sets of a work in relation to Yellow River, of course, it's about 21st century Yellow River. So, I feel like maybe there's a conversation that we can do again with a Michael in order to dig into the historical time period, this particular aspect, so for whoever interesting, just checkout Michael Churney at Google, artist residing in Beijing. So with this note, we will have to conclude our event. So Ruth, I feel sorry that I have to rush you again, again today, but this is a really, because your talk and your book have generated so much enthusiasm. We've gotten so many wonderful questions and we still have several questions that we were unable to cover. So, whoever's interested in professor Ruth Mostern's research and her new book, reach out to her, Professor Mostern at University of Pittsburgh and find out her emails and shoot her a message, I believe in her busy schedule, she will find a time to connect to with you. So, let me remind you quickly, on November 5th, we will host a talk with a Professor Ying Jia Tan at Wesleyan University to talk about energy history in modern China, electricity for those China scholars here, if you notice them pass three weeks, China's been experiencing tremendous across nation electricity shortage which has created so much panic in China right now, that means you should come back to listen to professor Tan's talk on energy history. So, let me thank Ruth for producing such amazing book and for offering us a wonderful glimpse into this book. It's such a tremendous achievement, congratulation and thank you for sharing it with us. Okay, so.

- Yeah, and thank you all for coming.

- Great, so wonderful to see you all and Ruth take care. We'll be in touch.

- Good, bye bye.