

Urbanization and Environment
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Module - 04
Urban environmental social sciences frameworks
Lecture - 22
Urban Environmental History: Europe Part I: Context and Themes

So, hello everyone and today in this particular lecture, I will be discussing Urban Environmental History. So, we had already discussed urban environmental history with our special focus on the US, North America. Today I will be covering Urban Environmental History, with Europe as the empirical focus. And in this first lecture, so I have actually divided this lecture into two parts.

So, lecture 23 would be discussing you know the emergence of European urban environmental history, where will be basically discussing about some of the fundamental themes, you know that the historians brought to the fore, when they started discussing urban environmental intersections. And in the next lecture, that is lecture 21, I would be shedding light on the mode thematic variations as we also did you know, so far as the US was concerned.

So, we in European urban environmental history also, I will be discussing you know the recent advances in this domain, where the ambit of this particular domain have kind of enlarged to incorporate and integrate methods, methodologies, frameworks, approaches from other you know significant fields like environmental justice, political ecology, proctology etcetera.

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CONCEPTS COVERED/ ROUTE MAP

- emergence
- expansion
- key themes and scholarship

So, let us first discuss you know European urban environmental history in general by shedding light into the context of the emergence you know of this particular domain. And then how this field gradually started expanding through series of workshops, conferences, symposium etcetera.

And of course, like these workshops and the round table discussions, then were further documented and compiled into very interesting volumes. So, in this particular lecture, I would be kind of doing a historiographical tour, where I will be exposing you to the key themes and state of the art analysis, you know so far as European urban environmental history is concerned.

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nature-culture confluence

➤ **Themes include:**

- infrastructures
- the flow of matter
- cities as distinctive ecosystems

...the city as environment
the natural environment as
essentially urbanised
phenomenon (Soens et al.
2019)

Urban environmental history

So, you know like this has been a central theme, a central tenet, a fundamental idea so far as urban environmental history is concerned, the nature culture concerns. And this we know now already that, how the historians working on urban history and you know the historians focusing on environmental history, initially they did not talk to each other.

But then now we know that how since the 1990s, historians and also social scientists from other domains, they are increasingly looking into or they are addressing city nature intersections. So, so far as you know the several themes in European urban environmental history is concerned, urban metabolism is again a fundamental concept.

So, this book, which I recently came across; this is also you know a recent book edited by a very leading European urban environmental historians like Tim Soens and Dieter Schott. So, in this particular book which came out, this is edited volume and we will definitely be discussing several chapters you know of this book, in the next lecture when we will be discussing the recent advances in European urban environmental history.

So, in this particular book, which came out in 2019; this editor say that, city is should be understood as environment and the natural environment as an essentially urbanized phenomenon. So, and I find this remark to be quite remarkable or significant; because you know this directly it shed lights on the nature culture confluence that we are discussing, when we are discussing urban environmental history as a whole.

So, themes of urban European urban environmental history include you know like urban environmental history of any part of the world, infrastructures, flow of matter flows. So, urban metabolism or flows on which we will discuss you know quite a lot in this lecture and also in the next lecture.

So, this flow of matter or urban metabolism, seem to be one of the very core tenet, fundamental tenets so far as European urban environmental history is concerned. And you know in several chapters or so far as this particular field is concerned, we have more edited volumes; three, four very significant edited volumes which have come out and this is also very recent.

We do not have whole lot of articles, but we have very good and very significant cutting edge, you know path breaking book chapters, which we will be actually discussing about. So, this domain actually considers cities as distinctive ecosystems and also as social ecological systems; but at the same time also you know the Europeans, the European historians, they are quite aware, they are quite sensitive also to the limits of you know understanding or perceiving cities as socio ecological systems.

So, we will come to this. So, the method that I will follow here in discussing European urban environmental history, would be you know from simple to complex method. So, first let us just try to discuss the emergence and expansion of the field and then gradually we would kind of discuss or I would reflect on the more nuanced narratives.

So, these are some other like very like fundamental and core themes of EUEH. And again this is another remark, which I have taken from this particular book called urbanizing nature, and here cities are understood as social and environmental entities. So, socio nature, cities as socio natural conglomerate and as objects of co construction and co evolution.

So, the co evolution and co constitution of urban and the environment; the co constitution and co evolution and the co construction of nature culture, so one of the fundamental and predominant themes in EUEH.

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An early dawn

➤ range of topics:

- epidemic and climatic developments, unpredicted natural events
- the destruction of nature caused by demographic developments
- urban and industrial emissions leading to the pollution of water and air



Now, this is a key point which I would like to mention that, though you know this the journey may seem to be quite recent, but there was an early dawn. There was definitely an early dawn, because I would definitely you know talk about this particular article, though it is written in French; but it is a very popular article, which has been discussed quite a lot and this is by the Annale French historian Emmanuel Le Roy Ladurie.

So, Le Roy Ladurie when he you know this talked about this history of environment, so in English this would be history of environment. So, in 1974 in this particular publication, Emmanuel Le Roy Ladurie, he talked about different range of topics, which should comprise environmental history in general or as a whole.

And what we see here in his you know prescribed list, the urban occupies a kind of a predominant space. So, if you see the range of topics, range of topics that Ladurie suggested; you will see that how urban and you know various themes, which remain quite or which become more significant within the urban space is already there.

So, Ladurie already hinted you know about or why and how the urban should incorporate or should get incorporated within the larger debates of environmental history. So, you know the range of topics include epidemic and climatic developments, unpredicted natural events, so hazards risks etcetera. Destruction of nature caused by demographic developments and also you know here urban has a vantage point; because all of us know that the cities are the most densely populated spaces.

And urban and industrial emission this is direct; so urban and industrial emissions leading to the pollution of water and air. So, according to Ladurie, this should have been I mean he suggested that this should be one of the very serious themes within environmental history; that is urban emission, industrial emission, emissions at urban spaces and its effects on water, air, other ecosystem resources. Then also overload of urban space by material structures, people and noise.

So, this is also quite interesting; I do not really, I did not really come across whole lot of literature on this. So, maybe this is still quite a bit of an uncharted terrain. But definitely you know bits and parts of it have been discussed by works, by some scholars, you know when they discuss several other things or when they discuss mainly urban ecological footprint and also you know the unequal relationship between cities and their wider ecological infrastructures or cities and their wider hinterlands.

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long-term development of urban

- correlation between socio-spatial patterns of urban development and environmental factors
 - how different kinds of pollution affected urbanization throughout history (Bernhardt 2001)
- debates about the management of resources in the “wooden city” (Sombart 1928)

So, this is again another key theme that this the environmental aspect or the European environmental history, urban environmental history is very much in tune to the long term development of urban society. So, by this I mean that, you know the debates of European urban environmental history; it seems to be very much tied in into the wider debates of long term development of urban societies.

So, the historians they discuss, they talk about you know their core relationship; the correlation sorry, the interrelationship between socio spatial patterns of urban

development and environmental factors. And how you know these socio spatial patterns, they impact the environment and also in turn get affected by this process.

So, the process also seems to be reciprocal and cyclical in that sense. So, for example, Bernhardt, he talked about how different kinds of pollution you know affected urbanization throughout the ages. So, he provided a kind of a long term temporal scale to the issue of pollution and how different types of pollution started also affecting urbanization in different ways.

So, again another important aspect or another important contribution; long back 1928 this particular scholarship by Sombart, it expose us to debates about the management of resources in the wooden age. So, very long term you know temporal skill. So, and one interesting kind of dissimilarity, a striking dissimilarity that I could find out, I could found out between you know urban environmental history of Europe and US is the fact that the temporal scale.

So, far as the American context is concerned, it is not very far flung, it is not extremely stretched back; it does not predate you know the colonial period as such, though there are very few works. But basically you know the temporal scale is still the modern period and by modern period, I mean you know the major interventions when started taking place in terms of hydraulic infrastructures or urban utilities, right.

So, Europe also in this urban utilities or modern hydraulic and sanitation infrastructures is a key theme; but what we see in European urban environmental history is that, the historians they had discussed a lot even about you know the pre industrial societies, the pre industrial period.

For example, we will discuss a work in our next lecture by Eva Jacobson which has come out recently, where she discusses you know water allocation or he also, she also discusses you know this the relationship between water and society across eight long centuries.

So, what I am trying to say is that, the temporal scale for European urban environmental history is really really long. And I think that this is a significant point, because you know as we have such a like vast scale in front of us; so it becomes easier for us to kind of I mean predict scenarios.

So, you know all of us know now that, for forecasting, back casting; why and how back casting is also a very important methodology. So, if back casting involves a very stretched temporal scale then I think the impact or the significance of the temporality, of this extended temporality really can make a whole lot of sense.

And in that sense historical works can really, then have potentials to kind of inform policy debates and you know complement different ideas like urban sustainability, conservation, heritage, etcetera; that the discussions which are much invoke in these present times of the urban anthropocene or the urbanocene.

So, anyway yes urban infrastructure again is an important theme within European history, but I mean again very much rooted in European economic history. So, what this historians have done is that, they have kind of shown the inter linkages among political, cultural, social, and economic aspects and how all these aspects definitely are interrelated to nature and vice versa.

So, long term development of urban societies again as a key theme in European urban environmental history, which you really need to remember. And the temporal scale is really really, I mean it is an extended temporality. And I mean if we compare urban environmental history of Europe with other parts of the world; I think the European historians have done a fantastic and fabulous job in terms of this extended time scales.

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The 1990s

- an internationalization of the scholarly debate
- series of conferences and publications
- eminent urban environmental historians – Christoph Bernhart, John R. Luckin, Geneviève Massard-Guilbaud, Simone Neri Serneri and Peter Schott
- 1998 (Venice) – European Association for Urban History (EAI)

So, looking into the emergence and gradual consolidation of this European urban environmental history as a formal or a formalized discipline; I think we can definitely kind of contextualize this whole thing within the larger international events, when the US also was making whole lot of advancement in this particular field and it was also kind of influencing historians and environmental social science scholars of other parts of the world.

So, and of course, Europe also started playing an important part in this whole debate, in this urban environmental debate. And we see series of conferences and publications and mainly for initially conferences and from those conference papers, I volumes have been edited. And we also have fascinating volumes which have like, which have been published last year and in 2019.

But you know the journey started a bit before, when very significant workshops started being conducted by ESEH, which is this European Society for Environmental History. But also European Association for Urban History that is EAUH for the first time in the late 1990s started dedicating panels you know to urban environmental problems or challenges.

So, and during this time we also find like works by very eminent historians are by environmental historians like Christoph Bernhardt, Bill Luckin, Massard-Guilbaud, Simone Neri Seneri whose work will be discussing you know. So, he has worked on the canal systems of Milan Italy and Dieter Schott.

So, Dieter Schott is again a very very significant name in this particular field. And so, these historians they started organizing panels and roundtable discussions on European urban environmental history, during the late 1990s. And I already discussed that how in Venice for the first time European Association for Urban History, it hosted an entire panel on you know urban environmental problems.

And in 1999, when ESEH was formalized and ESEH also started dedicating its panels and several discussions surrounding, you know questions relating to urban environmental equations.

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2000s

- 2000 (Berlin) – EAUH – *Cities and Catastrophes*
- series of roundtable meetings
 - 2000 (Clermont-Ferrand) – pollution
 - 2002 (Leicester) – emphasis on resources
 - 2004 (Siena) – reiterating the making of the contemporary city
 - 2006 (Paris) – on milieu, material and materiality
 - 2008 (Berlin) – the place of the city in environmental history from m

Now, 2000s of course, the discipline got more formalized and consolidated. And in 2000 again in Berlin we find that, EAUH again organizing a session on a conference on cities and catastrophes. So, catastrophes again natural disasters or also what is not natural, in natural disasters or hazards. So, all these discussions, all these discussions were taking place with I mean with the turn of the century.

So, series of roundtable meetings and I have listed a few significant roundtable meetings, which were organized and conducted between 2000 and 2008. So, the first decade of the 21st century; so the first one you know being held at Clermont Ferrand and the main theme was pollution, 2002 Leicester the emphasis was on resources and resource mobilization, and then 2004 Siena, where there was whole lot of reiteration on the making of the contemporary city.

Paris on milieu, material and materiality; very interesting this roundtable meeting was held in Paris. And 2008 in Berlin again, you know the wider discussion on the place of the city in environmental history from multiple perspectives. So, all of us now know you know one of the key themes in urban environmental history is the place of the city in environment.

And how you know they make and we make each other and they get, I mean and how you know this relationship is really cyclical and so something which Martin Melosi discussed. And of course, he wrote a seminal article called the Place of City, you know

in environmental history. So, these discussions also surfaced so far as the European context or the European cities were concerned.

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urban metabolism

- **Barles (2020): the significance of the concept in the 21st c.**
 - role of cities in global environmental change
 - the idea of a circular economy
 - an ecological transition came to the fore of the political agenda
- **city-nature interactions through**
 - material, energy and substance flow analyses
 - urban-environmental imprints

So, urban metabolism, this is such a significant theme; this is the most significant theme I would like to say so far as European urban environmental history is concerned. Sabine Barles again is a very renowned historian, who has walked on utilities and also you know sewage, food production systems, and human excreta management; we will discuss one of her work, actually we will discuss one of her work. But when we discuss that, we also kind of, I will be able to discuss other works of Barles.

But you know at least what I will be able to do is that, I will be able to kind of discuss and talk about the major arguments you know that Barles came up with. So, and I think this arguments are very very significant in terms of, in terms of modern sanitation systems.

And what you know cities should actually do, how would cities tackle the larger question of urban sustainability. If somebody really needs to get into the crux of it, I think discussing works by Sabine Barles is mandatory. So, Barles actually you know she has worked on metabolism, if you see all her works. And in 2000 2020 book you know that I discussed with you. So, the 2020 book by this, so there is a there is an edited volume which has come out last year by Haumann Martin Knoll and Mares.

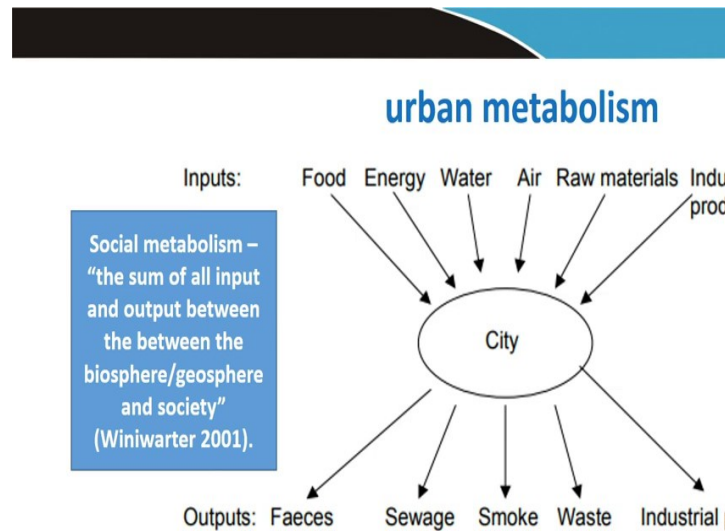
So, in that book there is a chapter by Sabine Barles, a chapter and the I mean the title of the chapter itself is Urban Metabolism, where Barles has kind of compiled all her views and arguments about this particular thing. So, she says that, you know with the turn of the century when several debates on territorial ecology, industrial ecology, and urban ecology surface; then why the scientists started thinking that urban metabolism is such a significant concept.

And why is this concept so significance? Because you know it needs to be located within the wider context of the role of cities in global environmental change; it enable us to understand you know the role of cities in global urban environmental change. It help us to understand you know the idea of circular economy in a far better way and also makes us aware of the ecological transition that started coming to the fore with a turn of the century, you know of the political from the political point of view.

So, in political agenda also, this ecological transitions it started occupying very significant space. And city nature interactions you know through this if we apply or if we deploy the framework of urban environmentalism, sorry urban metabolism; then I think city nature interactions can be absolutely understood and traced through or in terms of material, energy substance flow analysis.

I will again discuss this in my next slide, I have a illustration on urban metabolism, which will help us to gain more clarity on this particular concept. But for now we have to remember that, urban metabolism is very significant in terms of making us understand this city nature interactions through material, substance, energy flow analysis. And urban environmental imprints in the form of ecological footprint, water footprint, carbon nitrogen imprints, etcetera.

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So, this is the illustration or the diagram I was talking about. And this diagram actually, I have taken this diagram from an article which was published by Dieter Schott. And I think again this is one of the very first articles which was published in 2004 on urban environmental history, where Dieter Schott says that you know he kind of introduced the significance of the framework and what lessons can be learned by urban planners, policy makers, urban experts from you know urban environmental history.

So, it is a very significant article and the article is there in the reference list that I have put here. So, this particular concept of urban metabolism has been kind of explained through this diagram. The diagram developed by M Fischer Kowalski and Kowalski talks about or kind of explains urban metabolism through two major ideas that she talks about. So, one is this social metabolism and the second one is colonization of nature or colonizing interventions.

So, what is social metabolism? So, social metabolism is the sum total of all input and output between the biosphere, geosphere and society. And you know I also took this from Winiwarter. So, Winiwarter and her team you know from Vienna, they are very significant in terms of this discussing urban metabolism and also they have done whole lot of work on water.

And Winiwarter talks about, explains defines a social metabolism and sum to know all inputs that are city receives and all outputs that are city disposes you know and social

metabolism is actually the sum total of all these inputs and outputs that help us understand flows in cities.

So, and how urban metabolism I mean can be, urban metabolism can be retained and there should not be any metabolic rift. So, this is the kind of a normative, but I mean I do not think we should be having linear discussions on this, because this is a very very complex process. And in my next lecture, again I will discuss you know that how historians have started adding layers you know to this particular thing.

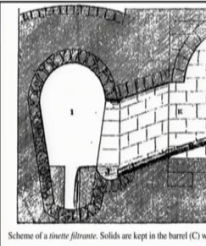
They are they have started really addressing this complexity which is actually very fascinating. So, these inputs and outputs are very very important and social metabolism can actually be explained through the sum total of these inputs and outputs, that are city receives and the city kind of disposes.

On the other hand, colonization of nature or colonizing intervention is the sum total or the sum of all purposive changes made in natural systems that aim to render nature more useful for society. The, that particular typical you know that capitalist framework this you know looking into nature as a commodity to cater to our needs, to a social and economic needs. So, and these two concepts together I think are quite important in the making or helping us understand urban metabolism.


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Paris

- shifting perceptions and practices in managing wastes
- 'hunger arising from the furrow, and disease from the stream'
 - maximization of nutrient recovery
- domestic water supply – debate on the appropriateness of the combined sewer system associated with sewage farms
- end of the circularization phase
- demographic growth – Seine as the disposal channel
- urban landscape and infrastructure



Scheme of a Parisian sewer. Solids are kept in the barrel (C) while



So, alright, so I was talking about the works by Sabine Barles. So, Sabine Barles again is one of the very first urban environmental historians, who kind of deployed transdisciplinary understanding or perspectives while she talked about flows or more importantly she focused on the management of human excreta or human excreta management.

So, you can see you know in several works by Sabine Barles. So, again Paris is her central focal spatial scale of analysis. So, she has worked a lot on Paris and Paris's you know waste disposal and waste recycling mechanisms, discussing the strategies from the historical period.

So, at least you know for a stretch of two to three centuries from the 19th at least you know from the first decade of the 19th century to the present times. And so, recently I also access one of the articles, very recent book chapters actually by a Esculier and Barles, which has come out in a particular handbook you know on the Seine basin on the Seine basin.

And here Esculier and Barles they also kind of compiled the previous works and they talked about how there had been shifting understanding and practices, so far as waste is actually concerned. So, for example, they you know when the their historical scale or the historical time period which is starts in the 19th century, in the first half of the 19th century; then they discussed that how you know the first sewage experiments were done and they were quite successful and switch was spread on agricultural land and there was a gradual increase in the size of this firm.

So, by the middle of the 19th century, it almost I mean the size increased to 5000 hectares the land area of the sewage farm. And, but gradually what happened is that, you know the population of Paris stabilized; but the urban conurbation, there was a demographics part.

And so, there was more demand you know for the for this for the extended size of the farms; but unfortunately you know there was a crisis, because on one hand this demand was high the requirement was high. But on the other hand during the world war First World War, that is the first half of the 20th century, this work came to a halt and you know sewage farms could no more be extended.

So, it was really, I mean it was a massive crisis for the municipal city of Paris. And, but then what happened is that, then in a very modern way; quote unquote modern way, urban service try to cater to dual goals at the same time. So, taking care of soil fertility and leading to agricultural productivity through the use of sewage on one hand and also on the other hand catering to the health hygiene hygienic needs of the city.

So, the dual goals of urban service and became you know tackling hunger arising from the furrow and disease from the stream. But then what happened is that, of course we see that there are; I mean we find out that there are there were debates, there were stormy upsurges you know kind of flooding the bureaucratic circles on the effectiveness of the combined sewer system.

So, whether this combined sewer system was really appropriate for the city of Paris and when it was also like so drinking water facility one hand and the drinking water this canals carrying drinking water and these sewer canals carrying the sewage and dumping it to the sewage farms.

So, then certain complexity, certain problems also arose. So, what happened is that, the new nutrients that you know the sewage farms now received; for example, fossil for phosphates or you know several other kind of nutrients and also a much larger increase in the nitrogen and phosphoric content, which kind of then disqualified as urban fertilizers.

So, what happened is that, you know almost there was the end of the circularization phase and on the other hand, the demographic growth was continuing. And finally, I mean the very unfortunately, sewage started getting disposed into the Seine river. And then the Seine of course, started getting polluted and when it became a disposal channel.

And the WWTs, that is the Waste Water Treatments or the waste treatment plants really you know could not function very effectively; they became inadequate in terms of the other social and ecological problems or constraints of the city. And on the other hand, agriculture started becoming specialized more and more. And so, there was a disconnection between crop farming and livestock farming in this modern agricultural specialization and it opened you know this new bio geo chemical nutrient cycles.

So, what happened is that, this waste recycling or rather waste management became such a linear system. And as circularization, I mean circularization could not continue anymore and it was replaced by linear waste management systems or the linear human excreta management system, which kind of created an absolute disconnection between food production and human excretion on which Sabine Barles actually kind of lamented.

And waste then even in perception, in our perception, in our cognitive understanding, immediately waste started to be perceived and understood as filth. So, finally, you know I find this chapter to be so significant, because you know they address our current problems.

And Esculier and Barles say that or they you know kind of pose this question that, today you know the Europeans for example, European cities, they are kind of talking about, bringing back you know this circular economy and bringing back this circularization of waste, where waste can be really recycled in a feasible manner at least by 2060.

So, that sustainability questions can be addressed in their best possible manner. But then Barles argues that, in order to do that, a better integration, just look at the right hand side of this particular slide. So, what needs to be done, technical apparatuses and technical arrangements cannot solve this problem. So, what do we need to do for this, in order to you know bring back circularity or circularization?

We need a better understanding or integration of social metabolism and urban policies, decompartmentalization of urban and rural policies. So, and a transformation of the material culture of urbanites, this is also so very important and then only you know this can be tackled.

So, what do we need in short can be explained in terms of what Esculier and Barles, suggest socio ecological transition. And in order to if you need to really gear ourselves or if the European cities need to gear themselves are you know to towards this particular agenda, long term agenda then first what is important is that, the identification and mapping of this entire process across historical times really really need to be done.

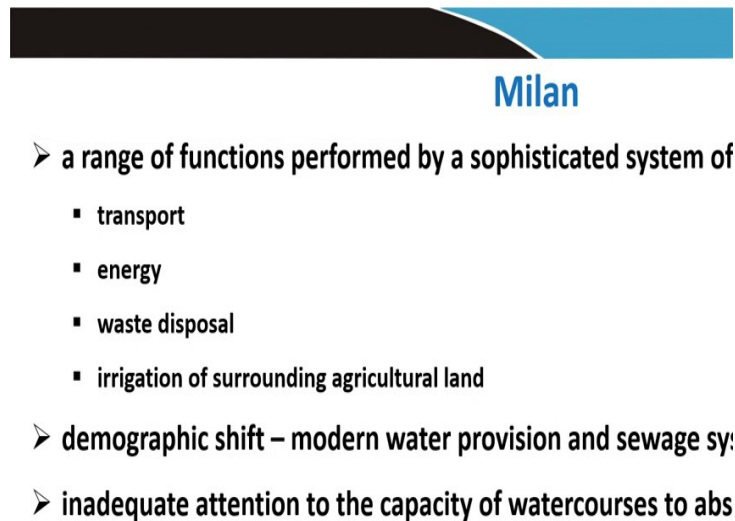
So, the final work that I would like to discuss here. So, I definitely discussed you know the works, the book chapter by Esculier and Barles a lot. But you know this is something, this work I consider to be a compilation of various ideas that also you know kind of that,

was there in several other works of Barles when she started, when she started kind of publishing her articles and book chapters on the city of Paris.

So, Sabine Barles is one of the, I mean I should I think that I should definitely consider Sabine Barles and Sabine Barles's work when I discuss the initial wave of European urban environmental history. So, though, so again the point of clarity or the point that I need to really make here is that, though I am discussing 2020 a book chapter by both of them; but this book chapter I consider it to be a compilation of several other works by Sabine Barles.

And these works she published long back when European urban environmental historians first started you know discussing and working and publishing on various cities like Paris, like Milan, etcetera.

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So, again another work which I would like to contextualize within this initial phase of European urban environmental history is the works by Simone Neri Seneri. And Simon Neri Seneri has worked extensively, you know on the city of Milan. And so, for example, he talks about the very.

So, he also discusses you know the shift in this particular city and its impact you know when the city actually kind of it the canal system, that played an important role in kind of

performing several functions. This canal system was replaced the pre modern, in that sense the pre modern canal system was replaced with modern hydraulic infrastructures.

So, he discusses about you know this the how the sophisticated system of canals actually performed a range of function in the city of Milan including transport, energy, waste disposal, irrigation of surrounding agricultural land, etcetera. But when there was a demographic upsurge again; then of course that provided a material or a kind of a legitimate context to for the deployment of modern water provision and sewage system.

But unfortunately you know when this plan was made and when the urban modern water provision and sewage systems were implemented, inadequate attention was given by the urban planners and the experts to the capacity of water courses, to the capacity of these water courses actually to absorb organic pollutant substances.

So, what was the end result? The end result was that soon within like few decades, there was the near collapse of the entire regional hydrological regimes and there was widespread pollution of agricultural land near Milan. So, Simone Neri Serneri actually you know warns us and warns the urban experts and planners about the very fact that, maybe you know this kind of modern water provision might seem to immediately solve or tackle the tackle health hygiene problems and public health issue of a particular city.

But at the same time, one must be very sensitive to the fact that, it can actually generate collateral problems. So, finally, I also you know this with this I also remember the works, several other works for example, most significantly the work by Tapio Katko and he is an expert on Finland.

So, it is a Finnish expert who you know talked about the behavioral change, you know that happened when this modern utilities, urban utilities were actually implemented. So, previously you know the; so, he says that, previously the women they used to travel from earth and moons; they used to travel between earth and moon and back to kind of you know in order.

So, he uses this phrase to make us understand that, the kind of distances that the women actually had to cross between, the distance between the source of water and you know their own households or cow shed for that matter. But when I mean with the modern flush toilets, a dishwasher, and piped connections, washing machine etcetera; it

definitely you know all these kind of impacted our behavioral choices and our consumption patterns.

And in the waste this modern hydraulic infrastructures kind of it skyrocketed the consumption from 50, almost tenfold like from 15 but 10 to 15 liters per capita per day to 150 to 200 liters per capita per day. So, one can really try to imagine the co lateral and long term path dependent implications of these technological infrastructures.

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CONCLUSION: Key highlights

- the prelude/early dawn of urban environmental imagination: reflections
- 1990s – the period of emergence and expansion
- 2000s – the period of consolidation

So, these are the references, please go through some of this. And yes, in this lecture, we have discussed or I have exposed you to the early dawn or the prelude of urban environmental imaginations and reflections, when I discussed the especially the work by Le Roy Ladurie in the 1970s.

And then we talked about how this particular field of European urban environmental history merged and expanded, started expanding in the 1990s and it was further formalized and consolidated in the 2000s. And urban metabolism is the key theme in

urban environmental, European urban environmental history. And in this particular lecture, we also have discussed two very significant path breaking works on the city of Paris, France and the city of Milan, Italy.

So, the city of Paris by I mean several works I mean the earlier works and also the later works; but mainly you know how Barles for the first time started working on human excreta management system in Paris and then Simone Neri Serneri's work 2005, 2007, where he also discussed urban metabolism of Italy.

So, thank you.