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ENVIRONMENTAL AND ECONOMIC HISTORIES: EXAMPLES FROM PRE-MODERN EUROPE[1]

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Environmental history has only recently emerged as a field of study for scholars who systematically examine the human past. It has grown out of the increasing concern for perceivable degradation in the physical surroundings of a rapidly growing population and serious concern about the future emanating from the work of scientists who study climate. Economic History is, compared to environmental history, an old and well-established sub-discipline. While some writers concerned with the past long gave consideration to the economy it was the Industrial Revolution and the emergence of what one contemporary called "the dismal science"[2] in the first half of the nineteenth century which generated works that concentrated on how people over time have dealt with the problem of scarcity. Karl Marx and Friedrich Engels offered not only a theory of economic history but for all human history and relations of people to the means of production (M a r x, E n g e l s, 1888). Their work, starting in the middle of the nineteenth century, and the interpretation of it and the reaction to it led by the early twentieth to a vibrant field of study. Institutionalized in scholarly periodicals, monograph series and then in academic departments, the pattern of its rise to prominence in the years after the Second World War is one which environmental history is following in the early twenty-first century. The growth in environmental history is coincident with the decline in interest in economic history. There are many reasons for the disinterest in past economic performance and one is the close relationship between the two fields of environmental and economic history.

The topics that enriched economic history in the twentieth century often encroached on the study of the environment. Agricultural history is only the most obvious example. The central role of farming in premodern economies made it a logical

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[2] The famous British historian Thomas Carlyle used the phrase in 1849 and in 1850 to refer to political economy and emerging social science in general.

subject for study and with such study came examinations of what people did with the landscape. Industrial history of the last two centuries and even in the preceding centuries made economic historians examine environmental degradation caused by growth in output and the application of new technologies. Demographic history, so much a part of the analytical tool kit of applying an understanding of macroeconomics to the past, inherently involved the study of the relationship of people to disease and land use. The history of comparative economic development, the examination of the differing performance of different regions and states, has long been a central component of economic history. Why some parts of the world are rich and some poor is a question that has driven a broad range of research and that research often involves questions of the contribution of the physical environment to economic success or failure. The history of commerce could be one of the oldest topics in economic history but the movement of goods and of people, the ability to specialize in production because of access to distant markets, had an impact on what people did with and in the world around them. Some of the groundbreaking work in environmental history had a strong component of economic history (C r o n o n, 1991). When scholars and activists organized the first meetings to discuss the past of human relations with the environment a number of economic historians participated, interested in the emerging field and in seeing how their own work fit with that of the practitioners of the new and rapidly changing area of research.

In short, economic history is environmental history but they are not the same. The two may share the same raw material and many of the same questions but the approaches of the two fields produce different methods and often different results.

The approach, the starting point for environmental history, is the axiom that *Human history is the history of human interactions with nature*. These interactions are understood to be a basic feature of society. Social structures, forms of organization and governance, economic and political systems co-evolve with the relationship of human beings to nature (O o s t h o e k, 2011).

The approach, the starting point for economic history is the axiom that *Human history is the history of scarcity*. Since there are always shortages, or more precisely people think there are shortages then human beings seek to increase the goods and services available to them. History then describes and analyses the different methods people have used over time to solve the problem of scarcity. Social structures, forms of organization and governance, economic and political systems co-evolve with the relationship of human beings to perceived shortages.

In the discipline of ecology human action can, and in the views of some ecologists must, lead to environmental deterioration and degradation. There are critical tipping points which exist in the natural world. Once those are passed then preceding conditions can not be restored. Human action, once beyond some moment, generates irrevocable results. The eradication of species is only the most obvious example of going beyond a tipping point. In the discipline of economic markets, and in the views of some economists all of society, has built in and automatic self-correcting mechanisms. As any known good becomes more scarce, it becomes more valuable. As people prize it more they will take action to preserve it, that is so long as having it around does not cause damage to society. Value is reflected in the prices people are willing to pay and so price indicators will act to prevent moving beyond tipping points. In fact prices should offer warning signs well in advance of serious danger so

the movement of prices should act to generate sustainability. The "dismal science", at least in matters to do with the environment, then provides a much more optimistic view of the future than ecology and suggests much less active intervention in the relations between people and the environment. The differences between economics and ecology on that general and critical point have left their stamp on the related fields of historical study.

In recent years the study of pre-modern Europe, the era up to and including the start of the Industrial Revolution, serves to illustrate how closely connected economic history and environmental history are but also to show that their roots have generated some distinctions in conceptions and conclusions about people and their physical surroundings in the past. One obvious case is the study of the origins of the first Industrial Revolution in England in the eighteenth century. A second is discussion of consumer choices and the impact on the environment of some of those choices.

BRITISH INDUSTRIALIZATION

Two recent books have confronted the question of the roots of early industrialization, a topic that has bothered economic historians almost from its start and which bothers those interested in economic development even now. Joel Mokyr points to the importance of ideas, of the way people thought about the natural world in creating conditions for improved production methods. For him the Enlightenment of the eighteenth century not only set the stage for industrial growth but also was the essential force which opened people in western Europe in general and England in particular to new ways of solving the scarcity problem (M o k y r, 2009). Robert Allen, on the other hand, sees factor prices as the driving force behind technical innovation and the adoption of new ways to produce goods. Britain, he finds, had high labour costs, considerably higher than almost anywhere else in Europe or for that matter in Eurasia, in the eighteenth century. The Kingdom also had some of the lowest energy prices. The presence of coal in large quantities and easily available gave access to an alternative to energy supplied by human muscle, that is if only devices could be found to convert the heat from coal fires to useful work. Varied innovations that solved that problem created the complex industrial structure of the British economy which emerged in the early nineteenth century and which would eventually raise standards of living (A l l e n, 2009). The shift to the use of fossil fuels from organic ones such as firewood and grain to feed people and animals has long been recognized as a central feature of industrialization and the transformation of the world economy over the last two centuries. The energy metabolism of post-industrial regions is dramatically different from those continuing the practices which date from the agricultural revolution of about 12,000 years ago. Per capita energy use in the developed world is now more than five times the sixteenth century world average. Once people had fire, they raised their annual energy consumption to between 6 and 8 gigajoules per year. The average across the world had probably gone up to between 7 and 9 gigajoules per person per year by the eighteenth century thanks to the development of settled agriculture. In the post industrial era with reliance on fossil fuels averages are now about 55 gigajoules per person per year (M a l a n i m a, 2011). Europeans were ahead of others in the world and by the sixteenth century were using considerably more than the

world wide average of energy, probably in the range of 22–25 gigajoules per person per year in the fifteenth century (U n g e r, 2011). One consequence of that greater energy consumption was a relatively high standard of living. Another, possibly, was environmental degradation.

John U. Nef more than sixty years ago argued, though not exactly in ecological terms, that rising energy consumption led to the destruction of woodland and so a change from organic to fossil fuels and so precipitated a precursor to the English industrial revolution in the late sixteenth and seventeenth centuries. His indicator of a wood shortage was the pattern of price changes. The sixteenth and early seventeenth century was a period of sustained overall price increases, of a 'price revolution', but in England firewood prices rose even faster than the general price level.

T a b l e 1

Indices of Prices in England (1451–1642) (N e f , 1932)

Years	General Prices	Firewood
1451–1500	100	100
1603–1612	251	366
1633–1642	291	780

Nef claimed, and with some justification at least in 1932 when the statement was published that, "So rapid an increase in the cost of any commodity in common use must have been almost without precedent in the history of western civilization." (N e f , 1932). The growth in the population of the city of London in the sixteenth and seventeenth centuries meant that if the city was to get its heating requirements, met by using firewood, an increasing proportion of the land area of southeastern England and for that matter of England as a whole had to be devoted to supplying the metropolis. Estimates of consumption per person and of the efficiency of producing firewood per each hectare of ground indicate the land requirement of the growing city. If everyone in London had relied on firewood, population figures for the mid eighteenth century project land needs for growing trees as different as about 675,000 hectares to 1,900,000 hectares. Even the lower estimate is considerable since the total land area of England was 15,000,000 hectares. If the share of the total devoted to woodland would have been about 20 % then London alone, not considering other towns and people in the countryside or uses for wood other than heating, would have been taking up something like 22 % of all wood produced, that is if heat came from wood (G a l l o w a y, K e e n e and M u r p h y, 1996; W a r d e, 2007). If a higher estimate of land required is correct then, even more obviously, London could not have grown to its eighteenth century population. There simply would not have been enough wood. The reason the city achieved its rate of expansion and continued to grow was because consumers found another way to heat their homes and fuel the burgeoning industries of the capital. Coal imports into London were already at an annual average of 445,000 tons in the years from 1700–1704 and by 1790–1794 the pace was over 1,000,000 tons (F l i n n, 1984). The shift to coal, to using fossil fuel in place of firewood, for Nef and other economic historians made possible the growth of London

and the development of various industries there. The development would have been impossible without the supply of coal. Paul Warde estimates that somewhere around 1619 England and Wales coal was already a greater source of energy than firewood, a shift to fossil fuel that would take place in the rest of the world but considerably later than the first half of the seventeenth century (W a r d e, 2007).

The case for explaining increasing coal consumption by a shortage of firewood has not been immune to criticism. Warde does not claim that the early change to fossil fuel in England was necessarily a product of wood shortage and has even argued that, in general, in Europe wood supplies were adequate to accommodate a significantly larger population than the numbers of the seventeenth century (W a r d e, 2006). "The notion that there was a "timber famine" in Tudor and Stuart England has a long pedigree, but recent generations of historians have cautioned against placing much reliance on the lamentations of contemporaries about the death of trees and wood, and many have urged the rejection of the notion of the existence of any but localized shortages." (H a t c h e r, 1993).

Complaints about the disappearance of forest thanks to the demand for firewood often came from areas of the country where sizeable English charcoal iron industry was active. Also coal, the new fuel that was to drive industry, was used as much for domestic heating as it was for manufacturing. As late as 1700 nearly half of all coal consumed in England, including exports to Ireland and other countries, was used in homes. Even as late as 1830 with the Industrial Revolution well underway the share of coal that went to domestic uses was over 37 %. Measuring consumption by kilocalories per person in 1700 domestic use accounted for over some 47 % and as late as 1775 at the threshold of industrialization the number was some 42 %. A shift to using the increasing output of coal for industry began to appear in the last quarter of the eighteenth century. The shift was dramatic with the domestic share in per capita calorific terms falling to some 35 % by 1800 (F l i n n, 1984). The figures indicate that coal did fuel the early Industrial Revolution but they also show that the coal was available to do that because of the pre-existing network of mining and transportation which made energy in that form available at a relatively low price. As early as 1585 the price in southern England of a joule of energy from coal was less expensive than it was from wood and by about 50 %. Consumers preferred to use wood since it was more flexible, the size of the pieces dictating the speed of burning. Wood also gave off much less noxious odours. In the seventeenth and eighteenth centuries, "Coal use expanded because improvements in mining and transportation were lowering its cost to consumers rather than because England was running out of wood." (A l l e n, 2003). English fuel costs in real terms were low relative to most parts of Europe, and that was especially true because of the inferior alternative, coal, being so easily available.

The Industrial Revolution is a case where the study of economic history and environmental history can and do inform each other. While the balance of evidence indicates that it was not an environmental crisis that caused a shift away from wood to coal and so from organic to fossil fuels. The claim that in eighteenth century Europe, "The energy potential of the given area was in a sense exhausted." (S i e f e r l e, 2001), is clearly too extreme. On the other hand, it is also wrong to see the transformation in the economy as one immune from environmental forces and consider-

ations. Economic historians rightly point to the relationship of the prices of the factors of production as a contributing if not a determining force in deciding the mix of inputs to production. Prices certainly have a role in influencing the choices of energy sources and also in related choices of the technologies used to harness and deploy those energy sources. Prices depend on many things, both on the side of demand and the side of supply. While it is what people think they need that shapes demand, with supply prices are heavily influenced if not determined by environmental conditions. The cost of extracting natural resources depends on the location and terrain in which the materials are found. The cost of delivery to consumers depends on the character of the land or water over which people need to move the goods. The technology deployed to deal with the environment, whether for extraction, refining, fabricating or transporting, depends on the environment being confronted. For England and for the shift to fossil fuel having coal in large quantities relatively close to the surface and at the coast or along rivers, all within relatively easy reach by short distance sea transport to a major city and centre of industrial production made a significant difference in the gradual shift, starting in the sixteenth century,s to using fossil fuel. Those factors played an even greater role in the development of energy-intensive technologies in the eighteenth century which yielded the opening stages of the Industrial Revolution. While economic historians may point to prices and environmental historians to the areas of land devoted to producing wood, the analysis in each field of the general development of British and European industry in the eighteenth and nineteenth centuries shares many features. The two groups shine the spotlight on different issues and may express concern about different issues but the forces which were at work are similar for both.

ENVIRONMENTAL IMPACT OF A CONSUMER CHOICE

In the years around 1200 brewers in German towns along the coast of the North Sea found ways to produce hop-flavoured beer of consistent quality and in high volume. Hops had been around for centuries and was apparently used to make beer in western Europe in the early Middle Ages. Exactly what technological breakthrough those German brewers made is not obvious. The results, however, had a far-reaching impact on the economy but as much or more on the environment. Up to the thirteenth century the typical additive for beer in northern and western Europe was a combination of herbs called *gruit*. The principal ingredient was probably bog myrtle, a relative of the willow tree. In the course of the thirteenth, fourteenth and fifteenth centuries hops superceded *gruit* first in north German breweries and then in turn in the Low Countries, England, the Rhineland, Scandinavia and Bavaria. The new product had the advantage of being more durable. Hopped beer remained drinkable for six months or more so it could be brewed in cool months, stored and then drunk when temperatures rose along with the thirst of drinkers. It could also be shipped over some distance without spoiling and so became a commodity of international commerce. The distribution of beer through northern European trading networks led to brewers throughout the region imitating the production of the good. By the sixteenth century hopped beer was the dominant fermented drink from the eastern Baltic to the Danube to Ireland (U n g e r, 2004). The shift was in part inspired by environmental

considerations, made possible by environmental changes and had a lasting impact on the environment. The shift in consumption with beer replacing wine as a preferred alcoholic beverage had dramatic effects on land use.

In the mid fourteenth century European population collapsed in the wake of the appearance of what contemporaries called the Great Death. Whether it was bubonic plague or not the disease has a devastating effect, killing between a third and a half of Europeans on its recurrent visits through the rest of the century and into the following one (H e r l i h y and C o h n, 1997). Though estimates vary total population of the continent in 1400 was perhaps 40 % less than it was in 1300. Whatever the source of the epidemic that led to such widespread loss of life the change in the environment had a dramatic impact on the economy and on the relationship between the much-reduced population and the land.

The fall in numbers of workers changed the ratio between labour and land and allowed the rural tillers of the soil as well as skilled tradesmen in towns to demand increases in recompense for their efforts. Higher wages and falling rents for land, the corollary of the effect on wage rates, shifted relative incomes among social groups. Workers could enjoy a higher standard of living. Among other choices they decided to consume an increasing portion of the vitamins and minerals they got from grain in liquid form, replacing bread to some extent with beer (M i s k i m i n, 1969). Barley was probably the preferred cereal for brewing but by no means the only grain brewers used. Wheat was popular and to a lesser extent oats with even rye used in some instances. Brewers were typically subject to strict civic regulation in German and Low Countries towns with the proportions of various grains dictated by town authorities (U n g e r, 2004). The change in consumption patterns led to a shift to growing more barley. The shift though had two much more important and far-reaching environmental implications.

Making beer with barley considerably reduced the quantity of energy available per hectare of cultivated land compared to using the same land to grow wheat or rye for making bread. Barley had the same potential energy loss through milling as other grains but delivered about one-sixth less energy per litre than either wheat or rye and about 13% less than oats. For oats yields per acre were considerably lower than for barley. In fact barley yields net of seed and taxes in England were higher than for the other principal food grains which mitigated to some degree the energy loss from a shift to barley. The much greater consideration, however, was the loss of joules from transforming the grain into beer instead of into bread. Malting grain, grinding it followed by incomplete extraction of vegetable matter from the grain in mashing and then boiling before fermentation all led to loss of energy content. While changing wheat or rye into bread meant a loss of something on the order of 20 % of the energy potential in the raw grain making barley, or any other grain for that matter, into beer meant a loss of something like 70 % (C a m p b e l l, 2000, 222–224, 332–333, 392–393). To get a drink with alcohol and which was durable Europeans gave up a considerable source of energy. Since human muscle power supplied something like 10 % of the total energy deployed in early modern Europe (M a l a n i m a, 2001, p. 51–68) giving up almost three quarters of what could be generated from the consumption of food grains had an impact on what work could be done. Other shifts in production and consumption more than compensated for the loss of the energy in

grain from converting it to beer instead of bread. In a sense Europeans had, under the new circumstances after the Great Death, energy to give away (U n g e r, 2011).[3]

The change from wheat, rye or oats to barley had an effect on the environment, on the appearance of fields and to a limited degree on the character of the soil. The changes in landscape, however, was minor compared to the effects on the landscape from consumers shifting from drinking wine to drinking beer. The arrival of hopped beer on markets in the Low Countries and England in the fourteenth and fifteenth centuries offered an alternative to wine which had always enjoyed premium status and so a higher price. It was a luxury drink but the new hopped beer, which had the same or less chance of spoilage, could compete with the product of the grape. Beer consumption rose in northwestern Europe toward the end of the Middle Ages with wine consumption suffering as a result. By the fifteenth century urban levels of beer drinking were on average about 300 litres per person per year. Urban regulations show that the amount of beer produced from a litre of grain varied widely. Still an average of somewhere around 1.0–1.5 litres of beer for each litre of grain used seems reasonable. If farmers got about 300 litres of wheat and 400 litres of grain, net of seed and taxes, from each hectare they farmed then it took anywhere from about 0.5 to 1.0 hectares of farmland to produce enough grain to supply a beer drinker for a year. For a wine drinker the land requirement was considerably less. Growing grapes was much more labour-intensive. Work required was greater and spread throughout the year, not concentrated in ploughing and harvesting as with grain production. Wine consumption levels in the fifteenth century in the Low Countries were about 25 litres a year, considerably less than beer consumption. Wine output levels are notoriously difficult to estimate for the Middle Ages. Reports from the nineteenth century, before the introduction of chemical fertilizers and pesticides, show wide variation depending on the soil, grape grown and weather. Production of wine fell into a wide range of from 500 to 1000 litres per hectare, an estimate which can serve for the late Middle Ages. The land requirement per drinker, given wine consumption levels, then was about 0.05 hectares per drinker. That was more or less one-tenth the land area needed to satisfy a beer drinker. Each individual who abandoned wine for beer meant that agriculture had to find ten times as much land. Not only did the appearance of the landscape change but so did the area under cultivation (U n g e r, 1998, p. 329–337). While a complete change from one drink to the other was rare and while the ratio of land requirements of the two drinks suggests a much more dramatic transformation than occurred, the estimate does illustrate the potential environmental impact of a change in consumption pattern, one based on technical advances in brewing and economic changes which led to more people drinking more beer.

The shift to beer had an effect on the environment in other ways. With the adoption of hopped beer brewing the province of Holland in the Low Countries saw a rapid increase in production, output finding drinkers not only at home but also in export markets in the southern Low Countries and in England. By 1514 output was around 144,000,000 litres per year from hundreds of small breweries in towns

[3] U n g e r, R. W. suggests an increase in available energy in the era after the Great Death of about 17 % overall, including any loss from the shift to beer from bread.

throughout the province. Gouda, one of the major centres of production, was by the 1480s making over 25,000,000 litres a year on average. Haarlem in 1514 was not far behind at 20,000,000 cultivation (U n g e r, 2001, p. 73–88). The brewing process involved heating not only the beer in the brew kettle but also boiling water for the mash tun where vegetable matter was extracted from the ground malt. Beer was easily contaminated by bacteria and though brewers did not understand the chemistry of contamination they did understand that washing their containers and utensils with hot water made for a better product. That meant they needed even more thermal energy to make beer. The principal but no means the only source of that energy for Dutch brewers around 1500 was peat. As with all calculations to do with energy use in the late Middle Ages generating reliable estimates of how much peat brewers used to make each litre of beer is extremely difficult. Historians have generated figures based loosely on contemporary sources ranging from 20 to 97 peat tons per brew (C o r n e l i s s e, 2007, 286–287, 297[4]; U n g e r, 2001, 100). The numbers create questions about the size of the brew and the size of the peat ton. Estimates range from 30 to 106 barrels produced each time a brewer made beer. A barrel was about 120 litres (Y n t e m a, 1992, 157; U n g e r, 2011, 171–172). According to one author the peat-ton was around 100 kilograms, a figure based on the peat being rather dry, with a volume of about 0.227 cubic metres (D e Z e e u w, 1978, 3–31). Taking a generous figure of 50 peat-tons per brew and assuming a brew to have been a generous 50 barrels, then it took 1 peat-ton of 0.227 cubic metres to produce a barrel of beer. With production at 144,000,000 litres or 1,200,000 barrels then it took 300,000 cubic metres of peat per year to meet the needs of brewers in Holland.

The impact on the land from peat digging was a source of some anxiety in sixteenth century Holland which makes assessing the impact of brewing on peat consumption all the more important to the history of the environment. The development of dredging in the fifteenth century to get at peat below the surface created anxiety in Holland. A considerable area of the province was below sea level and digging down to get peat could threaten the dikes that protected those low-lying lands. Governments went so far as to restrict or even prohibit dredging. To get peat for brewers if digging was done to a depth of about 1.0 metres, a conservative figure given the use of dredging, then 300,000 square metres of surface area per year was cleared to get the 300,000 cubic metres of peat needed to make beer. That is 30 hectares or a little less than a third of a square kilometre.[5] The number is by any measure low. The peat requirement would be even lower if the use of firewood and coal to make beer were included. Coal burning was in its infancy in beer making but firewood was a viable substitute and was the source of heat for most brewers in late medieval Europe. Even though brewing was a boom industry in fifteenth century Holland the environmental impact of what seemed to be massive use of peat was small. Air pollution was presumably small as well since peat did not generate the same noisome fumes that were particular to coal. Over the course of a century digging peat from 30 hectares of ground did make an impression on the landscape of Holland. If the shift to beer

[4] He quotes estimates of Y n t e m a (1992).

[5] An alternative method of estimation based on the physics of thermal energy use yields even lower estimates for the total land area affected.

brewing made an impression on the late medieval environment it appears to have been considerably more in the use of agricultural land than in the supply of energy for the brewing industry.

INTERDEPENDENCE OF ENVIRONMENTAL AND ECONOMIC HISTORY

The two cases of the Industrial Revolution and the shift among late medieval consumers to drinking beer indicate the ways in which human interrelation with the physical world and the efforts of people to deal with perceived shortages were connected one with the other. For historians ignoring such connections create serious dangers. While questions and methods may differ between economic history and environmental history the impact of economic changes on the environment and the constraints on the economy created by the environment bring the two fields together in wrestling with analysing the past. The number of cases that illustrate that simple conclusion could easily be multiplied.

In Bulgaria, and southeastern Europe in general, efforts to understand the changes in the geography and importance of the Danube River to all the lands of its sizeable basin over the long term offer another instance where historians, and for that matter geographers, ignore the connections between the economy and the environment at their peril. People from earliest settlement along the banks of the river and its tributaries understood there were economic uses for the waters that flowed toward the Black Sea. Agriculture needed the water as an input to supplement or replace rainwater. Manufacturing, as it developed especially from the nineteenth century on, needed the water as an input in a wide range of industrial processes, one of which was making beer. Well before the growth in industrial production in the Danube valley people used the river to transport goods and at considerably lower cost than by any other method in use in the region. The river system as a way to move commodities created trade ties among the different lands in southeastern Europe, ties which transcended barriers of religion and politics. The flowing waters also provided energy to the populations along the river banks and for centuries. The recent massive hydroelectric projects had precursors in the many watermills, some simple horizontal devices, which for centuries replaced muscle power in tasks such as grinding grain. The river system influenced relative factor prices largely but not exclusively through lower cost of transportation for goods shipped on its waters. The Danube had the potential, and in many ways, to address the central problem for the economy. It could and did play a major role in relieving scarcity.

There were and are real constraints on that potential, however. Harnessing the river to deal with human needs and wants creates costs. Like all actions using the Danube does not come without sacrifice. The impact is sustained not only by the river but also by the people who set out to use it. The construction of large dams to feed increasing electricity requirements of a world addicted to computer use involves sizeable financial investment and the work of an army of construction workers. The blocking of the river creates problems for moving goods which have to be addressed, also at a cost. The landscape is changed and not just at the site of the dam but also up and down river with possibly disastrous effects on nearby settlement and agriculture.

Long term silting behind the dam not only decreases the volume of water held back, and so able to produce electricity, but also decreases the flow of soil to the lower river and its delta. The efforts to limit the flow of the river in the nineteenth and eighteenth centuries and the dikes built along its banks to protect settlement before that had, like the construction of watermills along tributaries or undershot wheels set in the river on floating platforms, less of an impact on the environment than projects of the twentieth and twenty-first centuries. Those earlier efforts to get more from the river, to attack perceived problems of scarcity among the people who lived in the extensive river valley, also made a difference to the river, changing it and giving it a different appearance and character. The river paid for the changes through greater vulnerability and the people paid in the investment in devices and strategies to harness the river to their needs and wants. It is that interrelationship between economy and environment which generates the most effective and the best understanding of the history of the region. Neither economic historians nor environmental historians should ignore the approach and the work of the others whether it is in examining the history of the Danube River and the Danube basin or any other region in the premodern and modern world.

REFERENCES

A l l e n, R. C. The British industrial revolution in global perspective. Cambridge; New York: Cambridge University Press, 2009.

A l l e n, R. C. Was There a Timber Crisis in Early Modern Europe? – In: Economia e Energia Secc. XIII–XVIII Atti della Trentaquattresima Settimana di Studi 15–19 aprile 2002, edited by Simonetta Cavaciocchi, 469–482. Prato: Le Monnier, 2003.

C a m p b e l l, B. M. S. English seigniorial agriculture, 1250–1450. – Cambridge studies in historical geography. Cambridge; New York, Cambridge University Press, 2000.

C o r n e l i s s e, Ch. The economy of peat and its environmental consequences in Holland during the late Middle Ages. Jaarboek voor Ecologische Geschiedenis (2005/2006), 95–121.

C o r n e l i s s e, Ch. Energiemarketen en energiehandel in Holland in de late middeleeuwen. Doctoral dissertation, Leiden University, 2007.

C r o n o n, W. Nature's metropolis: Chicago and the Great West. New York, W. W. Norton, 1991.

D e Z e e u w, J. W. Peat and the Dutch Golden Age The Historical Meaning of Energy Availability. A. A. G. Bijdragen 21, 1978, 3–31.

F l i n n, M. W. The History of the British Coal Industry. Vol. 2 1700–1830: The Industrial Revolution. Oxford, Clarendon Press, 1984.

G a l l o w a y, J. A., D. K e e n e, M. M u r p h y. Fuelling the City production and distribution of firewood and fuel in London's region, 1290–1400. – Economic History Review 49, no. 3, 1996, 447–472.

H a t c h e r, J. The History of the British Coal Industry. – Vol. I Before 1700: Towards the Age of Coal. Oxford, Clarendon Press, 1993.

H e r l i h y, D., S. K. C o h n. The black death and the transformation of the west. Cambridge, Mass., Harvard University Press, 1997.

M a l a n i m a, P. The energy basis for early modern growth, 1650–1820. – In: Early Modern Capitalism Economic and social change in Europe, 1400–1800, edited by Maarten Prak, 51–68. London and New York, Routledge, 2001.

M a l a n i m a, P. Energy in History. – In: World Environmental History in Encyclopedia of Life Support Systems (EOLSS), edited by Mauro Agnoletti, Elizabeth Johann and

Simone Neri Serneri. Oxford: Developed under the Auspices of the UNESCO Eolss Publishers, 2010 Rev. 2010; http://www.eolss.net (Retrieved January 19, 2011).
M a r x, C., F. E n g e l s, an authorized English translation, ed. and annotator Frederick Engels. Manifest of the Communist Party. New York, Labor News Company, 1888.
M i s k i m i n, H. A. The economy of early Renaissance Europe, 1300–1460, The Economic civilization of Europe. Englewood Cliffs, N.J., Prentice-Hall, 1969.
M o k y r, J. The enlightened economy: an economic history of Britain, 1700–1850. New Haven, Yale University Press, 2009.
N e f, J. U. The Rise of the British Coal Industry. – 2 vols. London, Routledge, 1932 (reprinted, London, 1966).
O o s t h o e k, K. J. W. Environmental History Resources. http://www.eh-resources.org/environmental_history.html: archived April 23, 2011.
S i e f e r l e, R. P. The subterranean forest: energy systems and the Industrial Revolution. Cambridge, White Horse Press, 2001.
S m i l, V. Energy in world history, Essays in world history. Boulder, Westview Press, 1994.
U n g e r, R. W. Beer, Wine and Land Use in the Late Medieval Low Countries. – Bijdragen tot de Geschiedenis LXXXI (1998), 329–337.
U n g e r, R. W. A history of brewing in Holland, 900–1900: economy, technology, and the state. Leiden, Boston, Brill, 2001.
U n g e r, R. W. Beer in the Middle Ages and the Renaissance. Philadelphia, University of Pennsylvania Press, 2004.
U n g e r, R. W. Late Medieval Energy Use, Social Metabolism and the Environmental Impact of the Black Death. Paper given at the California Medieval History Seminar, Huntington Library, 12 February, 2011, unpublished.
W a r d e, P. Fear of Wood Shortage and the Reality of the Woodland in Europe, 1450–1850. – History Workshop Journal, vol. 62, no. 1, 2006, 28–57.
W a r d e, P. Energy Consumption in England & Wales 1560–2000. Naples, Consiglio Nazionale delle Ricerche Istituto di Studi sulle Società del Mediterraneo, 2007.
W r i g l e y, E. A. Continuity, chance and change: the character of the industrial revolution in England. Cambridge (England), New York, Cambridge University Press, 1988.
Y n t e m a, R. J. The Brewing Industry in Holland, 1300–1800. A Study in Industrial Development. University of Chicago, 1992.

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ИСТОРИЯ НА ОКОЛНАТА СРЕДА И ИСТОРИЯ НА ИКОНОМИКАТА: ПРИМЕРИ ОТ ПРЕДМОДЕРНА ЕВРОПА

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(Р е з ю м е)

Историята на околната среда и историята на икономиката са две различни полета със собствени отличителни методи на изследване и научни цели. На практика те са силно свързани. Двата примера в настоящото изследване показват колко много са разделени тези два подхода и колко взаимосвързани са изследванията в тези две полета. По-нататъшните изследвания в областта на екологичната история на Югоизточна Европа ще се нуждаят от оценка на икономиката и връзките между човека и обкръжаващата го среда, разглеждани заедно.