RESIDENTIAL FUELWOOD CONSUMPTION AND PRODUCTION IN THE PLAINS STATES, 1994 pdf

1: Environmental impact of meat production - Wikipedia

Residential Fuelwood Consumption and Production in the Plains States, Dennis M. May CONSUMPTION â€¢ One in three households in the Plains States (fig. 1) had facilities to burn wood in.

Statistical Yearbook of Jiangxi Province. Chinese Statistical Press, p. Data were drawn from: Major land use categories were: Demographic data were collected on total population, literacy by sex , and social and economic factors such as per capita GDP, farmer income, and total consumption expenses. Data were collected at the county level on common biophysical variables such as latitude, longitude, annual temperature, and rainfall. Some types of data on land use and population have not been recorded periodically. For example, the national population census was conducted in and again in Detailed demographic data for each county and for some townships were extracted from censuses carried out at these levels. These censuses reported on urban and rural population, family size, fertility rate, infant mortality, life expectancy, rural-to-urban migration, and literacy. Data on land use were drawn from land use investigations at the county level where two detailed surveys of the Jitai Basin were conducted in and These data are more detailed than the statistics collected regularly on a larger scale. Some special field surveys on land quality have been conducted since the s. Growing Populations, Changing Landscapes: Studies from India, China, and the United States. The National Academies Press. The National Soil Survey of China, carried out from to , and the latest field survey, conducted in by the authors of this chapter, provide detailed information on land quality at scales of 1: Topographic maps drawn to a scale of 1: Roads, railways, and urban areas were digitized to construct base maps for a spatial database. Also incorporated into this database were 1: Various statistical methods were then applied to examine the interactions among the forces driving land use change. Proximate drivers are associated with activities that directly interact with and modify the physical environment Turner and Meyer, Underlying drivers, or root causes, influence how individuals or groups interact with and change the land. Of the main forces driving land use change in the Jitai Basin, the proximate driving forces are easier to identify and recognize. The underlying driving forces, which are far more complex and difficult to identify, arise from sources both external and internal to the region. External sources are mainly responses to the policies of the central government, population pressure, rapid economic development in coastal areas, and an increasing emphasis in some regions on environmental protection. Internal drivers of change are a growing local population, local government policy, and changes in local economic development and consumption patterns, which have been themselves influenced by myriad factors arising from the interactions among society, environment, and development. Since the Jitai Basin has experienced a variety of land use changes such as deforestation, reforestation, agriculture expansion, and urbanization although at a slow rate. These changes are in various ways associated with central government policies, as well as population growth and economic development.

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2: Energy Industries | www.enganchecubano.com

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List of wind turbine manufacturers Since many turbine manufacturing leaders have opened U. In total, 70 manufacturing facilities have begun production, been expanded, or announced since January Many existing companies in traditional manufacturing states have retooled to enter the wind industry. Under the MOU, the DOE and the six manufacturers will collaborate to gather and exchange information relating to five major areas: The turbine manufacturers compete with each other and cause decreasing turbine prices. Located on the Gulf Coast, the Texas facility will complement a similar facility that is being built on the coast of Massachusetts. Each year it is renewed, development has expanded. The tax credit expired at the end of , bringing wind power development activity to a near halt. A short term, one year policy was enacted at the beginning of which provides a tax credit to projects under construction by the end of and completed before the end of Almost three-quarters of wind energy subsidies in that year were direct expenditures and largely resulted from the ARRA programs. These figures do not include subsidies and supports from other levels of government. On January 1, the production tax credit was extended for another year. The extension phases out the credit over a period of five years. The 30 percent wind and solar tax credit will extend through and then taper to 10 percent in Wind farm and Environmental effects of wind power There is competition for wind farms among farmers in places like Iowa or ranchers in Colorado. Offshore wind power[edit] Offshore development is hindered by relatively high cost compared to onshore facilities. Several projects are under development with some at advanced stages of development. However, residents also cite improved electric power rates, air quality, and job creation as positive impacts they would expect from wind farms. The turbine project could provide 1. Cape Wind started development around , but faced opposition and eventually ceased before being realized. The floating VolturnUS operated in a Maine river in The study focused on a designated area off the coast to determine the current distribution, abundance and migratory patterns of avian species, fish, marine resources and sea turtle use of the existing ecological resources. The study concluded that the effects of developing offshore windfarms would be negligible. Previously, projects were only allowed in shallow state waters within 3 nautical miles 5. The edge of U. Increased distance from the coast diminishes their visibility. Waters off the coast of the United States are deeper than in Europe, requiring different designs. As a first of its kind project, it poses significant risks of encountering unexpected technological challenges and cost overruns. The power curves and technical parameters for the GE 2. Variations in wind speed result in variations in power output from wind farms, which poses difficulties incorporating wind power into an integrated power system. Wind turbines are driven by boundary layer winds, those that occur near the surface of the earth, at around feet. Boundary layer winds are controlled by wind in the higher free atmosphere and have turbulence due to interaction with surface features such as trees, hills, and buildings. Short term or high frequency variations are due to this turbulence in the boundary layer. The transient waves that influence wind in the Central U. Under the Bald and Golden Eagle Protection Act, the Interior Department could issue permits to allow "non-purposeful take" for activities where eagle deaths were considered unavoidable; however, as of December , no take permits had been issued to wind energy developers. The administration refused to divulge the number of raptor deaths reported to it by wind companies, saying that to do so would reveal trade secrets. The government also ordered federal law enforcement field agents not to pursue bird-death prosecutions against wind companies without prior approval from Washington. The policy was said to be an environmental trade-off to promote renewable energy. The Justice Department charged that Duke had designed and sited the turbines knowing that they would kill birds; Duke noted that it had self-reported the bird deaths, and that US Fish and Wildlife Service guidelines for reducing bird deaths by wind turbines had not been issued when the turbines were built. Under the year permits, wind power developers would be required to report eagle deaths, and the permits would be reviewed every 5 years. The measure was intended to remove what was seen as legal uncertainty discouraging wind energy investments. The government said that an environmental review was not needed for the change, because it was only an administrative change.

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3: Residential fuelwood consumption and production in South Dakota, - ECU Libraries Catalog

Get this from a library! Residential fuelwood consumption and production in the plains states, [Dennis M May; North Central Forest Experiment Station (Saint Paul, Minn.)].

Forests are severely degraded and the nation has long been considered an archetypal case of woodfuel-driven deforestation. However, there is little empirical evidence that woodfuel demand directly contributes to deforestation, but may contribute to degradation. We use MoFuSS Modeling Fuelwood Sustainability Scenarios , a dynamic landscape model, to assess whether current woodfuel demand is as impactful as it is often depicted by simulating changes in land cover that would result if current demand continues unabated. We also simulate several near-term interventions focused on woodfuel demand reduction to analyze the land cover impacts of different energy trajectories. We find that current demand may contribute to moderate levels of degradation, but it is not as severe as is typically portrayed. Aggressive interventions to reduce woodfuel demand could slow or even reverse woodfuel-driven degradation, allowing woody biomass to recover in some regions. We discuss the policy implications and propose steps to reduce uncertainty and validate the model. Export citation and abstract Original content from this work may be used under the terms of the Creative Commons Attribution 3. Any further distribution of this work must maintain attribution to the author s and the title of the work, journal citation and DOI. Introduction This study examines woodfuel supply-demand dynamics in Haiti and explores the implications of several near-term household energy pathways for the small island nation. Haiti has long been considered an archetypal case of woodfuel-driven deforestation [2 , 3] and popular environmental media have perpetuated this narrative [4 â€" 7]. However, more recent analyses have raised questions about the accuracy of these assessments. Recent analyses also indicate that the woody biomass utilized as feedstock for charcoal originates from coppice-based agroforestry systems rather than unmanaged woodlands [14 , 15]. These systems are fairly resilient and may represent a sustainable approach to woodfuel provision [16]. Moreover, in the absence of interventions, demand for woodfuels will likely increase, driven by rapid urbanization, which is often accompanied by a shift in residential energy use from fuelwood to charcoal, and a lack of investment in alternative sources of energy [17]. Interventions reducing woodfuel demand have been shown to support regeneration in degraded landscapes elsewhere [21]. A set of detailed simulations could indicate where impacts of additional woodfuel demand are likely to be felt, and whether interventions are likely to reduce future impacts. The analysis contributes to the literature on land use change in Haiti and informs environmental decision-making in the island nation. There are two main objectives: The scenarios simulate how different interventions focused on demand reduction could affect woody biomass and influence fraction of non-renewable biomass fNRB throughout the country. Background on charcoal and deforestation in Haiti Land cover change in Haiti can be traced to the colonial era. Through the 17th and 18th centuries, the French established a slave-based plantation economy that dramatically modified the landscape [22 â€" 24]. In the 19th century, a negotiated war indemnity with France was funded through vast timber concessions and settlements across the countryside [15 , 26]. In the early 20th century, US Marines occupied Haiti â€" , and expanded bridges and roads into previously isolated parts of the country [14 , 27]. Not long after, the US State Department noted there were virtually no commercially valuable timber species left in Haiti [28]. Charcoal for Port-au-Prince was initially produced from dry forests or arboreal fallows around the city. However, over time, fallow periods were shortened or eliminated altogether [30]. The woodlots contain small, young trees, or coppice from larger tree stumps, with densities ranging from open stands to impenetrable thickets. They are managed on 3â€"7 year rotations with a combination of active and passive measures. Evidence suggests that this type of coppice system can support a consistent yield for many rotations [15 , 16]. Nevertheless, these systems may be degraded if they are harvested at a rate that exceeds their regenerative capacity. When deforestation occurs, land cover and land use change from forest to non-forest. This can be visibly detected by remote sensing, but is rarely driven by woodfuel demand [36 , 37

]. This analysis simulates degradation by modeling losses in above-ground woody biomass or AGB. Modeling Our methodological approach applies spatiotemporal analysis and modeling techniques to publically available data for the entire country utilizing a platform called Modeling Fuelwood Savings Scenarios MoFuSSâ€"v1. The model is an open access platform that is designed to be used by any interested researchers. It consists of several freely available software packages bundled together. Appendix A consists of detailed instructions for downloading, installing and running MoFuSS for any test area within the country of Haiti, with parameters that are tunable through a user-friendly interface; default values correspond to those used in the present study. Beyond reproducing results presented in this study, third party users can open, edit and save all scripts. Table S1 in the supplementary material available at stacks. Equation 1 describes this relationship: Note AGB may increase or decrease from one time-step to the next depending on the relative magnitudes of C t i and. In reality they depend on biophysical parameters such as soil, hydrology, insolation, and altitude. Detailed data for these growth parameters is rarely available, particularly in data-poor locations such as Haiti. Lacking empirical data, we define K and rmax based on LULC classifications, matched with empirical data from other locations. Non-renewable biomass NRB is the amount of harvested wood that exceeds natural re-growth over a given time period. The ratio of NRB to total woodfuel consumption indicates the fNRB, which indicates the unsustainable proportion of harvested wood. The model iterates a series of time steps t with n-steps per simulation. There are three primary outputs at each time step: For each pixel at time t: To accommodate uncertainty, the analysis consists of multiple Monte Carlo MC simulations see supplementary material for details. C is input at each iteration so in order to simulate spatio-temporal changes in fuelwood use, which may linked to population growth, demographic change, or energy transitions like the adoption of efficient stoves or alternative fuels. Figure S2 shows gridded distribution of population using different types of household fuels, either alone or in combination. Census data indicate the prevalence of woodfuels, but not the quantity used, which is essential to model demand. Per capita charcoal and fuelwood consumption was assumed to be 0. These were used to create a gridded map of combined fuelwood and charcoal demand in figure S3 shows a map of aggregate demand in This is a typical yield from traditional earthen kilns in many locations around the world [43]. For these households, we assumed consumption of either charcoal or fuelwood was half that of households using those fuels alone 5. Supply Wood supply is a function of the quantity and accessibility of woody AGB [38]. Sustainability of the harvest depends on wood productivity. For this assessment, the productivity of woody biomass was based on the most recently available LULC data for Haiti, which provided spatially explicit land cover categories. Each category was then assigned a value for K and rmax as described above. In addition, based on observations in other woodfuel-dependent regions [45], we assume trees outside forests TOF provide a sizable fraction of supply, particularly for self-gathered demand, This includes trees on farmland, household compounds, and roadside commons. In each locality, the model first utilizes these sources to meet demand, but turns to other sources if demand exceeds the quantity that TOF can supply see [38] for a full description. To do this, the authors carried out a literature review and expert consultation to identify known areas where production is concentrated see the discussion and figures S5 a â€" b and S6 in supplemental materials. Integration of supply and demand In order to relate woodfuel consumption at specific points in space and time to supply sites, we project fuelwood and charcoal harvest events based on geographic accessibility, which is a function of proximity to populated areas, transport infrastructure including transport by boat 6 , land cover, and elevation see [38] for a full description. All locations, whether harvested or not, can accumulate woody biomass as described in equation 1. If AGB stocks in one location are excessively diminished in one time-step, that location is less likely to be harvested in subsequent time steps until stocks recover. We selected as the base year of the simulation to align with available demographic data. Integrating potential woodfuel supply and demand results in a mapping of harvest pressure for both commercial and self-gathered demand discussed in more detail in supplemental materials and mapped in figures S8 and S9. Scenarios Scenarios were developed in collaboration with the GACC Haiti team and divided into primarily urban and rural interventions. The transitions are summarized in table 1 below. Scenario characteristics describing potential transitions.

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4: Wind power in the United States - Wikipedia

*Residential fuelwood consumption and production in the plains states, [Dennis M. North Central Forest Experiment Station (Saint Paul, Minn.) May] on www.enganchecubano.com *FREE* shipping on qualifying offers.*

Water conservation Virtual water use for livestock production includes water used in producing feed. However, virtual water use data, such as those shown in the table, are often unrelated to environmental impacts of water use. For example, in a high-rainfall area, if similar soil infiltration capacity is maintained across different land uses, mm of groundwater recharge and hence sustainability of water use tends to be about the same for food crop production, meat-yielding livestock production, and saddle horse production, although virtual water use per kg of food produced may be several hundred L, several thousand L, and an infinite number of L, respectively. In contrast, in some low-rainfall areas, some livestock production is more sustainable than food crop production, from a water use standpoint, despite higher virtual water use per kg of food produced. Unirrigated land in many water-short areas may support grassland ecosystems in perpetuity, and thus may be able to support well-managed production of grazing cattle or sheep with a sustainable level of water use, whereas more water-demanding food crops would be unsustainable in the long run due to inadequate surface water supplies and groundwater recharge to sustain a high level of irrigation. Such considerations are important on much rangeland in western North America and elsewhere that can support cow-calf operations , backgrounding of stocker cattle, and sheep flocks. In the US, withdrawn surface water and groundwater use for crop irrigation exceeds that for livestock by about a ratio of For example, some grazing lands are unsuitable for food crop production, so that evapotranspirational water use would continue on land vacated by livestock, while additional water would be needed for crops to provide substituting food from lands elsewhere, and additional water would also be needed to produce substitutes for the non-food products of livestock. Of non-federal land in the US, about 43 percent is classed as unsuitable for cultivation. Irrigation accounts for about 37 percent of US withdrawn freshwater use, and groundwater provides about 42 percent of US irrigation water. However, rainfed agriculture, which cannot deplete its water source, produces much of the livestock feed in North America. Corn maize is of particular interest, accounting for about However, where production relies on irrigation from groundwater reserves, water table monitoring is appropriate to provide timely warning if groundwater depletion occurs. Effects on aquatic ecosystems[edit] In the Western United States , many stream and riparian habitats have been negatively affected by livestock grazing. This has resulted in increased phosphates , nitrates , decreased dissolved oxygen, increased temperature, turbidity , and eutrophication events, and reduced species diversity. See Animal Waste section, below. Greenhouse gas emissions[edit] Farmer ploughing rice paddy , in Indonesia. Animals can provide a useful source of draught power to farmers in the developing world At a global scale, the FAO has recently estimated that livestock including poultry accounts for about The indirect effects contributing to the percentage include emissions associated with the production of feed consumed by livestock and carbon dioxide emission from deforestation in Central and South America, attributed to livestock production. Using a different sectoral assignment of emissions, the IPCC Intergovernmental Panel on Climate Change has estimated that agriculture including not only livestock, but also food crop, biofuel and other production accounted for about 10 to 12 percent of global anthropogenic greenhouse gas emissions expressed as year carbon dioxide equivalents in [45] and in This is because of the need to replace animal manures by fertilizers and to replace also other animal coproducts, and because livestock now use human-inedible food and fiber processing byproducts. This is because degradation of methane nearly keeps pace with emissions, resulting in a relatively little increase in atmospheric methane content average of 6 Tg per year from through , whereas atmospheric carbon dioxide content has been increasing greatly average of nearly 15, Tg per year from through Among sheep production systems, for example, there are very large differences in both energy use [59] and prolificacy; [60] both factors strongly influence emissions per kg of lamb production. According to a study in the journal Nature , a significant reduction in meat consumption will be "essential" to mitigate climate change, especially as the human population increases by a projected 2. This type of production chain produces copious byproducts; endotoxin, hydrogen sulfide, ammonia, and particulate matter PM , such as dust, are all released along with the aforementioned methane and CO2. Air pollutants from these operations have caused acute physical symptoms, such as respiratory illnesses, wheezing, increased breath rate, and irritation of the eyes and nose. In this context, energy use includes energy from fossil, nuclear, hydroelectric, biomass, geothermal, technological solar, and wind sources. It excludes solar energy captured by photosynthesis, used in hay drying, etc. The estimated energy use in agricultural production includes embodied energy in purchased inputs. The Feed Conversion Ratio FCR is calculated by the taking the energy, protein or mass input of the feed divided by the output of meat provided by the animal. A lower FCR corresponds with a smaller requirement of feed per meat out-put, therefore the animal contributes less GHG emissions. Chickens and pigs usually have a lower FCR compared to ruminants. For example, in the US beef production system, practices prevailing in are estimated to have involved 8. Animal waste[edit] Water pollution due to animal waste is a common problem in both developed and developing nations. Table I-1 Concerns about such problems are particularly acute in the case of CAFOs concentrated animal feeding operations. In the US, a permit for a CAFO requires implementation of a plan for management of manure nutrients, contaminants, wastewater, etc. The EPA has published 5-year and 1-year data for 32 industries on their ratios of enforcement orders to inspections, a measure of non-compliance with environmental regulations: For the livestock industry, inspections focused primarily on CAFOs. Of the 31 other industries, 4 including crop production had a better 5-year environmental record than the livestock industry, 2 had a similar record, and 25 had a worse record in this respect. For crop production, the ratio was 0. Of the 32 industries, oil and gas extraction and the livestock industry had the lowest percentages of facilities with violations. Manure deposited on pastures by grazing animals themselves is applied efficiently for maintaining soil fertility. Animal manures are also commonly collected from barns and concentrated feeding areas for efficient re-use of many nutrients in crop production, sometimes after composting. For many areas with high livestock density, manure application substantially replaces application of synthetic fertilizers on surrounding cropland. Manure was spread as a fertilizer on about Altogether, in , manure was applied on about Manure biogas operations can be found in Asia, Europe, [80] [81] North America, and elsewhere. The US EPA estimates that as of July , manure digester systems for biogas energy were in operation on commercial-scale US livestock facilities.

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5: What has the author Dennis M Daley written

Residential fuelwood consumption and production in Wisconsin, Residential fuelwood consumption and production in the plains states, Kansas timber industry--an assessment of timber product output and use.

Department of Energy recognizes and monitors eleven sources for the production of energy, including biomass, coal, electricity, geothermal energy , hydrogen, hydropower, natural gas , nuclear power, petroleum, solar power, and power wind. Not all of these sources constitute separate industries, but all contribute to the industries that dominate the supply of American energy. Chief among the major industries are those that generate power by means of fossil fuels. The country for the most part was energy poor, relying on water mills for local industry and sail power for its ships. Yet time would prove that America held more coal than any other fossil fuel resource, with deposits in thirty-eight of the fifty states. Still, the beginning decades of the nineteenth century saw the use of coal only in blast furnaces and coal-gas limited natural gas lighting. Experiments with battery-powered electric trains occurred in the s and s; however, these innovations, together with such inventions as the cotton gin and the mechanical reaper, only served to supplement human labor as the primary source of power. Not until the second half of the nineteenth century did the work output of machines surpass that of humans and work animals. The first commercial U. Baltimore, Maryland, became the first city to light streets with gas made from coal in When the railroads extended into the plains and the mountains to the west, scant wood resources created a dependence on coal, which was more locally available and proved more efficient in steam locomotives. At the same time, the metals industry used increasing amounts of coal-produced coke to generate the iron and steel needed for the thousands of miles of track that led toward westward expansion, and coal became a primary resource during the latter half of the nineteenth century. With the beginning of the domestic coke industry in the later s, coke soon replaced charcoal as the chief fuel for iron blast furnaces. In , the first practical coal-fired electric generating station, developed by Thomas Edison, went into operation in New York City to supply electricity for household lights. At this time, petroleum served only as a lighting fuel and as an ingredient in patent medicines. Coal continued to feed much of this increase while electricity found a growing number of applications as well. In , the discovery of the Spindletop Oil Field in Texas made petroleum a more attractive resource, particularly when mass-production automobiles reached several million by The petrochemical industry became one of the most important of the energy businesses in just a few decades. The industry quickly grew in the s and s, as many of the major companies entered the field. By competition was keen, and Monsanto established a petrochemical subsidiary, a move that prompted similar reactions by other large chemical companies. The petrochemical industry continued to grow through the s and s; and in the years following World War II petroleum replaced coal as the primary fuel in the United States. The railroad industry switched to diesel locomotives but suffered increasing losses to trucks that could run on gasoline and diesel fuel. As natural gas lost American favor as a fuel for light, that industry shifted to other markets, notably heating for household ranges and furnaces. The coal industry survived in large part by supplying fuel to electric utilities nationwide. Michael Faraday invented the first electric motor in , but not until did Edison Electric Light Company come into existence, followed the next year by the first commercial power station in San Francisco. At the start of the twentieth century, electric power was young but growing rapidly. The work of engineers such as Nikola Tesla and Charles Steinmetz led to the successful commercialization of alternating current , which enabled transmission of high-voltage power over long distances. Electrical power stations evolved from waterwheels to dams with a variety of turbines: In , Charles Curtis pioneered the steam turbine generator, which generated 5, kilowatts from a plant that was the most powerful in the world at that time. Turbine generators required one-tenth the space and weighed only one-eighth as much as reciprocating engines of comparable output. In , the Edgar Station in Boston became a model for high-pressure power plants worldwide. Experiments continued to improve ways to adapt fuels for power generation, and the Oneida Street plant in Milwaukee began using pulverized coal in Adapting fuels to generate power was, and still is, an ongoing process. Increasing steam pressures also led the way to new materials such as chrome-molybdenum steel, which offered superior heat resistance in turbines. Power plants and improved fuel resources brought electricity to America. However, companies still focused most of their attention on urban areas, and only one in forty Americans enjoyed the benefits of electricity in the early twentieth century. Roosevelt chose Morris Llewellyn Cooke, an engineer, to head the new agency with the charge of making electric power available across the nation. As a result, farmers soon replaced steam or gasoline power with electric motors that drove farm machinery and water pumps. It currently operates numerous dams, eleven large coal-burning steam plants, and two nuclear plants in Alabama and Tennessee, producing more than billion kilowatt-hours of electricity annuallyâ€"about ninety times the power once generated in the region in By the s, the entire country was linked into two giant grid systems, each serving a respective half of the country, and power transmission increased from volts in the s to , volts by Energy Consumption in the United States Throughout the twentieth century, fossil fuels provided most of the energy in the United States, far exceeding all other sources of energy together. Since colonial times, the United States enjoyed almost self-sufficiency in energy where supply and demand balanced until the late s. Consumption began to surpass domestic production by the early s, and this trend has continued since that time. The United States at the beginning of the current millennium produced almost 72 quadrillion British thermal units Btu of energy and exported roughly four quadrillion Btu. Consumption totaled about 98 quadrillion Btu, and so still required imports of close to 29 quadrillion Btu, some nineteen times the level used in The major cause of shortages results from insufficient petroleum. For example, in , U. The embargo precipitated a sharp hike in oil prices followed by a two-year fall in petroleum imports. From to and again since , the price of crude oil continued to climb significantly with the effect of suppressed imports. Petroleum imports to the United States in reached a yearly record level of 11 million barrels per day. Despite the fact that electricity forms the basis of a major U. Electricity relies upon fossil fuels, hydroelectric power , and nuclear power for generation. Electric utilities have become large and complex in America, transmitted over long distances that span almost a half-million domestic miles. The result has been a 49 percent improvement between and , and the amount of energy needed to generate a dollar of output has fallen from almost 21, Btu to just over 10, Btuâ€"despite increased energy use brought on by a mounting population. This translates to increased energy consumption per capita of 63 percent, from million Btu in to million Btu in Energy continues to hold a key position in the economy of the United States, and energy spending keeps pace as well. Currently, American consumers spend more than half a trillion dollars on energy annually. Coal served as the leading source of energy for both residential and commercial consumers as late as but then declined rapidly. By contrast, natural gas grew strongly until and then stalled. Petroleum use grew at a slower, steadier pace but also peaked and declined around Only electricity, which was an incidental energy source in , has expanded almost every year since that time, due largely to the expansion of electricity-driven appliances in U. For example, 99 percent of U. Four-fifths of all households contained one refrigerator, and the rest had two or more. Other newer innovations such as microwave ovens and home computers have also increased residential energy use. In , only 8 percent of U. Home heating experienced equally large changes. One-third of all U. During that same interval, home fuel oil lost half its market share dropping from 22 percent to 10 percent , while natural gas and electricity gained as home-heating sources. Natural gas rose from one-fourth to one-half of all homes, and electricity gained, rising from only. Both electricity and natural gas have continued as the most common sources of energy used by commercial buildings as well. Alternatives to Fossil Fuels The America of the twentieth century has explored a number of alternatives to fossil fuels, and many of these energies are characterized as "renewable," since they do not rely on depleting finite stores of energy. That same year, President Bill Clinton issued an executive order calling for the federal government to reduce its energy use 35 percent by compared to levelsâ€"a measure that encourages alternative approaches to fossil fuel consumption. One such alternative resource is biomass, a term that refers to plant-derived organic matter available from dedicated energy crops and trees, agricultural food and feed crops, agricultural crop wastes and residues, wood wastes and residues,

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aquatic plants, animal wastes, municipal wastes, and other waste materials. The resulting biopower technologies provide options for the generation of electricity in the United States, with ten gigawatts of installed capacity. Biomass fuels derive from liquid ethanol, methanol, biodiesel, Fischer-Tropsch diesel, and other gaseous fuels such as hydrogen and methane. Bio-based chemicals and materials produce so-called green chemicals, renewable plastics, natural fibers, and natural structural materials. Another alternative industry has developed around the extraction of geothermal energy. This technology drills into the heated rock, injects cold water down one well to circulate through the hot, fractured rock, and then draws off the heated water from another well. In , John D. Grant drilled a well into geysers just north of San Francisco , California, with the intention of generating electricity. By , the plant had sixty-nine generating facilities in operation at eighteen resource sites across the country. Congress passed the Geothermal Steam Act in , providing the secretary of the Interior with authority to lease public lands and other federal lands for geothermal exploration and development. In , the government initiated its "GeoPowering the West" program to encourage research and development of geothermal resources in the western United States, with an initial group of twenty-one partnerships funded to develop new technologies. The Atomic Energy Act of gave the civilian nuclear energy program workable access to nuclear technology, and the following year, the Atomic Energy Commission announced a cooperative program between government and industry to develop nuclear power plants. Arco, Idaho, was the first U. In , the first power was generated by the Sodium Reactor Experiment, a civilian nuclear unit at Santa Susana, California. That same year, Congress enacted the Price-Anderson Act, designed to protect the public, utilities, and contractors financially in the event of an accident at a nuclear power plant. Also, the first full-scale nuclear power plant went into service in Shippingport, Pennsylvania. In the Jersey Central Power and Light Company created the first nuclear plant designed as an economical alternative to a fossil-fuel plant. By , nuclear power over-took hydropower to become the second-largest source of electricity, after coal. In , the Nuclear Regulatory Commission granted the Tennessee Valley Authority a full-power license for its Watts Bar 1 nuclear power plant, bringing the number of operating nuclear units in the United States to A number of other alternatives to fossil fuel have undergone research and development, including wind and solar power. These technologies exist primarily in the hands of the private sector and do not constitute industries in the same sense that petrochemicals or coal, for example, have become part of the national energy resources. The Future of U. Energy Use The Energy Information Administration has offered certain projections of American energy use in its Annual Energy Outlook , which suggests likely consumption through barring unexpected events like the oil embargo. According to these projections, energy prices are expected to increase slowly for petroleum and natural gas and may actually decline for coal and electricity. If these trends bear out, then U. The report also suggests that consumption in all areas will continue to increase, particularly in transportation because of an expected increase in travel as well as greater needs for freight carriers. Although Americans are using energy more efficiently, a higher demand for energy services will likely raise energy use per capita slightly between and

6: Residential fuelwood consumption and production in the plains states, / Dennis M. May. - CORE

Reports findings on the latest survey of residential fuelwood consumption and production in the Plains States. Topics examined include the geographic distribution of residential fuelwood consumption and production within the state; the species of trees used for residential fuelwood; the types of wood-burning facilities used; the reasons for burning fuelwood; and the land, ownership, and tree.

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