Ecosystem Workforce Program

WORKING PAPERS

Annotated Bibliography of Biomass Social Issues Literature

EWP WORKING PAPER NUMBER 19, SPRING 2009

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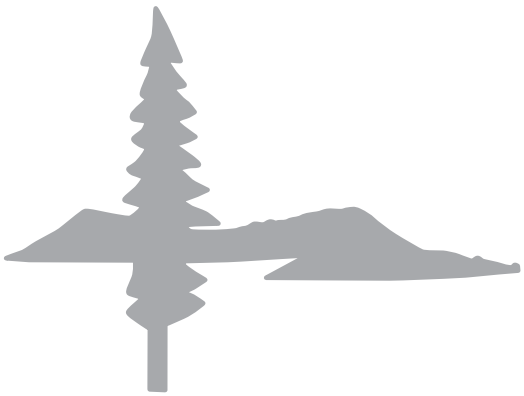

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Acknowledgements

This report was made possible by funding from the USDA, Forest Service Northern Research Station, joint venture agreenment 07-JV-11242300-080 and the Ford Foundation.

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Annotated Bibliography of Biomass Social Issues Literature

Articles are categorized into five primary categories:

1. **Community and Economic Development**

   The eight articles in this category focus on the community and economic development opportunities presented by biomass commercialization. These articles tend to present biomass in a positive light and are focused on the benefits of developing new biomass markets or converting existing infrastructure into biomass infrastructure. The benefits tend to be positioned in the context of jobs, maintenance or growth of resource management capacity, and local value-added production.

2. **Social Acceptability**

   Seven articles in this category focus on the social barriers and enablers to the development of a biomass utilization industry. These articles focus on issues of public perception, trust between interest groups, facility siting, and public participation in the development of biomass projects and facilities. Several of the articles focus on these issues in the context of forest restoration in the interior western United States.

3. **Equity and Externalities**

   The three articles in this category focus on the negative social aspects of biomass production. Two of the three articles in this category are European case studies that focus on public health impacts (e.g., increased emissions from transportation of biomass) and facility sitings in the vicinity of residential areas. The third article reviews barriers to commercial biomass development and includes a small section on equity concerns for labor resources, occupational hazards, and land values.

4. **Biomass Policy**

   The three articles in the biomass policy category focus on or include discussions of policy instruments that can give incentives to biomass development or that may provide increased parody for biomass in relation to other energy or heating sources. Instruments discussed include direct subsidies, climate change mitigation, tariffs, certification, etc. One article discusses the distinction between policies that are oriented towards large-scale centralized production and small-scale decentralized production.

5. **Socioeconomic Impact Discussion and Review**

   The seven articles in this category include reviews, syntheses, and discussion papers about the socioeconomic impacts of biomass production at the macroeconomic scale.

COMMUNITY and ECONOMIC DEVELOPMENT (8)

1. Becker D.R., M. Nechodom, A. Barnett, T. Mason, E.C. Lowell, J. Shelly, and D. Graham. 2009. Assessing the role of federal community assistance programs to develop biomass utilization capacity in the western United States. *Forest Policy and Economics* 11:141-48.

This article focuses primarily on the issues and experiences of community assistance efforts by the US Forest Service to increase the economic efficacy of fuels reduction through biomass utilization. The authors present the frequent lack of processing infrastructure to handle the potential amount of removed hazardous forest fuels as one challenge for biomass utilization. This challenge involves issues of scale and proximity to significant forest-based economies. The authors explain that funding for Economic Action Programs under the National Fire Plan lasted for only three years and was eliminated in 2004. Manufacturing and processing activities across the west received the largest percentage of funding, followed by economic feasibility and assessment studies, and pilot and demonstration projects. Project coordinators tended to invest in infrastructure and capacity-building activities, though they were wary of increasing the industry's financial dependency on federal funding. In one example, the community assistance program, distributed in grant form, increased interest among young adults to remain in the community to work for the utilization project. The authors learned that related businesses in the local economy, such as the trucking industry, experienced indirect job growth. The authors point out an example of a successful program in which partnerships between businesses, local governments, and members of the community led to increased resources for technical assistance and employee- training activities. Tribal members were trained to manage a saw mill and process small logs, which in turn increased their ability to acquire timber sales and carry out harvesting operations themselves. The authors conclude that community assistance programs may have a positive impact on local economies if they focus on synergistic activity, but the extent to which they increase fuels reduction efforts is inconsistent.

Keywords: Biomass utilization, community assistance programs, hazardous fuel reduction, western United States

Research Approach: Empirical

2. Borsboom, N. W. J., B. Hektor, B. McCallum, and E. Remedio. 2002. Social Implications of Forest Energy Production. In J. Richardson, R. Bjorheden, P. Hakkila, A. T. Lowe and C. T. Smith. *Bioenergy from Sustainable Forestry: Guiding Principles and Practice* (p. 265-97). Kluwer Academic Publishers. The Netherlands.

In chapter 6 of Bioenergy from Sustainable Forestry: Guiding Principles and Practice, the authors focus on the social benefits and disadvantages of bioenergy production and use in both rural and urban settings and provide analyses of studies of both direct and indirect effects. One area of focus is remote communities in Northern Canada. Direct benefits to these remote communities include lower cost heating, creation of long-term employment, and enhanced economic viability of existing forestry operations. Indirect benefits include increased retention of revenue in the community, greater community self-reliance, enhanced self-esteem, and reduced negative environmental effects of oil-based heating systems. The major challenge to biomass production efforts in these remote communities is the lack of infrastructure needed for efficient transportation of materials. Other studies described in the article show that projects based on agricultural crops tend to generate more employment, whereas large-scale and efficient mechanized systems of biomass production provide fewer employment benefits to local communities than small-scale farm systems. Analyses of the impact of biomass production efforts on jobs and earnings in Sweden in the 1990s determined that employment effects decreased with increased efficiency and were influenced by the level of technology in the operation. According to the authors, this lesson may

be applied to bioenergy production in general.

Keywords: Community development, employment, northern Canada, Sweden

Research Approach: Review

3. Domac, J., K. Richards, and S. Risovic. 2005. Socioeconomic Drivers in Implementing Bioenergy Projects. *Biomass and Bioenergy* 28:95-266.

This article analyzes socioeconomic benefits of biomass utilization and outlines how these perceived benefits drive increased use and implementation of bioenergy projects. Local communities are most concerned with the benefits of increased employment and income. Subsequent benefits include social cohesion and local economic stability. Difficulties arise in attempts to quantify socioeconomic benefits because of diverse technology, production processes, local economic structures, and social profiles of any given community. A product of the collaborative efforts of the IEA Bioenergy Task 29, this study contends that the rural placement of bioenergy plants may have positive effects by supplying direct employment and supporting related industries, such as the farming community and regional renewable energy technology providers. The authors claim such an infusion to local economies will stem rural depopulation trends. Introducing bioenergy to rural areas of developing countries would provide communities with access to electricity for cooking, water pumping, and income generation. However, the authors explain a discrepancy between wages for wood energy workers in developed versus developing countries, namely that workers in developing countries earn less than an average wage. Local health benefits for rural communities result from better wood stove design and avoidance of sulfur dioxide emissions from reduced use of coal in modern power plants. The article concludes with figures showing that thousands of jobs could be produced in many countries from bioenergy production projects. What is left unknown is how many jobs will be located in rural and urban communities.

Keywords: Employment, data gaps, policy, international comparison

Research Approach: Review

4. Fleeger, W. E. 2008. Collaborating for Success: Community Wildfire Protection Planning in the Arizona White Mountains. *Journal of Forestry* 106:78-82.

Fleeger's article chronicles the collaborative planning process responsible for the Community Wildfire Protection Plan (CWPP) for the Sitgreaves National Forest in Arizona. The process, which engaged local communities, resulted in the creation of woody biomass power plants that contribute to better air quality in the area and the addition of hundreds of local jobs. The author notes that about 75% of the jobs produced from the stewardship contract remain in the local community. However, there was some concern over the need for monitoring the fuel reduction treatments to minimize habitat disturbance. Nonetheless, the increased ability to use the biomass left over from fuel reduction projects in the Apache and Sitgreaves National Forests has increased the capacity of the wood pellet mill in Show Low by 50%, enabled the opening of a 3-MW plant in Eagar, encouraged plans to build a 20-MW plant in Snowflake, and effectively cut in half the cost of conducting fuel reduction projects. The article concludes by pointing to the cooperation and collaboration between the US Forest Service, local communities, and the design company as a key to success of the plan.

Keywords: Community Wildfire Protection Plan, Healthy Forest Restoration Act, collaborative management, wildfire policy, Sitegraves National Forest

Research Approach: Empirical

5. Gan, J., and C. T. Smith. 2007. Co-benefits of utilizing logging residues for bioenergy production: The case for East Texas, USA. *Biomass and Bioenergy* 31:623-30.

The socioeconomic benefits discussed in this study of the co-benefits of forestry-based bioenergy production in East Texas focused primarily on jobs and income generated from the bioenergy industry. Advantages for introducing bioenergy production in East Texas are the existing facilities and power-generation capacity in the area. It is assumed that the current infrastructure could remain intact and woody biomass would simply replace the fossil fuels used for electricity generation. The author utilized input-output modeling to measure the direct, indirect, and induced jobs and income created from bioenergy production, specifically from the labor and equipment involved with procuring logging residues and converting the residues to electricity. In the 43 counties included in the study, 560 residue-procurement-related jobs and 780 electricity-generation-related jobs would result. Other sectors beyond the logging industry that would experience positive job growth include agriculture and forestry-supporting activities, food services, industrial truck and equipment manufacturers, as well as financial and legal services. The authors explain that the limitations of the study were due to the diversity of various regions with regards to local economic structures and social profiles. Thus, although the study shows significant job growth for East Texas, the same may not be true elsewhere. The study does not provide detail on specific logging and electricity generation sites and the nearby communities. Instead, the authors present a model for the regional bioenergy industry.

Keywords: Forest residues, carbon value, site preparation costs, community impact, electricity

Research Approach: Modeling

6. Illsley, B., T. Jackson, and B. Lynch. 2007. Promoting environmental justice through industrial symbiosis: Developing pelletised wood fuel to tackle Scottish rural fuel poverty. *Geoforum* 38:21-32.

This article discusses the potential for wood biomass to reduce rural fuel poverty in Scotland. In 2002, 13% of Scottish households were in fuel poverty, including nearly 75,000 rural households. Wood biomass utilization for water and space heating would, the authors claim, alleviate some of the financial strain on rural communities that currently spend more than 10% of household income on heating costs. The authors also argue that wood fuel utilization would promote the co-location of combined heat and power facilities with pellet-mills, thereby developing localized small-scale industries that offer rural employment benefits without inducing large-scale production that is seen as less beneficial to rural communities. The Scottish forestry sector would benefit with increased job opportunities provided by an increased market value for wood pellets and forest products. Participants in surveys and focus groups about wood biomass heating systems development in Perth and Kinross echoed this sentiment. The authors also describe a situation in Northern Ireland in which a combined heat and power (CHP) biomass plant capable of producing 2.7MW electricity and 30MW of heat was to be added to an existing sawmill. The project would provide energy for 10,000 homes in the region, reduce truck traffic by 10,000 trips a year, and protect 1,000 jobs in the rural community. It is argued that similar projects would have similar social benefits in Scotland if the initial increase in market demand for wood biomass products occurs.

Keywords: Regional industrial symbiosis, rural fuel poverty, Scottish forest industries, pelletised wood fuel, energy service companies

Research Approach: Empirical

7. Krajnc, N., and J. Domac. 2007. How to model different socioeconomic and environmental aspects of biomass utilisation: Case study in selected regions in Slovenia and Croatia. *Energy Policy* 35:6010-20.

Krajnc and Domac outline a new model for measuring socioeconomic impacts of biomass utilization projects and draw from case studies in Croatia and Slovenia. The authors present a detailed description of the methodology used to develop the SCORE model. The focus is primarily on job creation and effects on unemployment, which stem both directly and indirectly from woody biomass utilization projects. Additional social issues included in the model, though the results are not given much attention in the article, are increased standard of living, environment, health, education, social cohesion and stability, migration effects, regional development, and rural economic diversification. According to the results of the case studies, regional differences can impact the extent of job creation and other socioeconomic benefits from biomass utilization projects. Regional differences include public vs. private forest ownership, existence of biomass heating plants, and existence or lack of heavy industry requiring significant amounts of energy. The study found that in the Savinjska valley Slovenia, 55 direct and indirect jobs would be created from biomass production, and 45 induced jobs would be generated due to high incomes from power production. In Karlovac County, Croatia, 218 direct and indirect jobs would be created and 134 induced jobs would be generated. Overall, the authors recommend the SCORE model to aid estimates of the impact biomass utilization may have in a given region, but only if reliable economic and other information about the region can be provided beforehand.

Keywords: Forest, biomass, jobs

Research Approach: Modeling

8. Neary, D. G., and E. J. Zieroth. 2007. Forest bioenergy system to reduce the hazard of wildfires: White Mountains, Arizona. *Biomass and Bioenergy* 31:638-45.

Neary and Zieroth focus primarily on the technical details of the Nutrioso Project of forest fuels reductions and forest thinning on public land in Arizona. Social benefits to local communities of the fuels reductions efforts and accompanying biomass-fired power plants include cleaner energy for 3,000 homes in the region and reduced emissions from coal-fired plants by using wood-pellet heating for large businesses and co-fueling the coal-fired plants. Plans for small and large power plants have developed in part because of existing facilities in rural areas and the cooperation between government and state agencies, tribes, and private enterprises. The private enterprises that receive the majority of the work from the contract are Future Forests LLC and Arizona Public Service Company, which are based in Arizona. However, the article does not expand on the economic benefit to communities in the region near the power plants and National Forests.

Keywords: Thinning, wildland-urban interface, pinus ponderosa, stewardship contracts, fuels treatments, USDA Forest Service, Arizona

Research Approach: Empirical

SOCIAL ACCEPTABILITY (7)

1. Almquist, W. 2006. Environmental Group Perspectives on the Utilization of Woody Biomass Derived from Hazardous Fuels Reduction Activities. Master's Thesis. Department of Planning, Public Policy, and Management. University of Oregon. Eugene, Oregon.

Almquist focuses on the perspectives of environmental groups towards woody biomass utilization and

fuels reduction activities. In addition, he mentions health and economic benefits of woody biomass utilization, including the reduction of serious health effects due to air pollution in the form of smoke and particulate matter, as well as the creation of nearly 5 jobs for every megawatt of energy produced from biomass. The findings of the study regarding social implications of woody biomass utilization include the following: environmental groups tend to support fuels reduction activities that ensure public safety to communities at risk of wildfire; these groups believe a mix of biomass use for energy and value-added uses will lead to more jobs for rural communities; concerns abound regarding over-thinning and expansion of harvest areas once the initial supply dries up, which could lead to the closure of large biomass plants and subsequent economic losses; siting facilities in forest-based communities create a more local and sustainable economy; and biomass utilization activities working in tandem with inappropriate and damaging logging practices, such as clear-cutting, only encourage such timber practices and should be avoided. The author concludes with a discussion of the importance of positive collaboration between government agencies, environmental group, and local authorities and councils to develop and implement appropriate fuels reduction activities in the communities most at risk from wildfire.

Keywords: Wildfire, supply concerns, logging practices, environmentalists, Oregon

Research Approach: Empirical

2. Becker, D. R., and J. Viers. 2007. Matching the Utilization of the By-products of Forest Fuel Reduction with Community Development Opportunities. In T. Daniel, M.S. Carroll, C. Moseley, and C. Raish *People, Fire and Forests: A Synthesis of Wildfire Social Services* (p.157-70). Corvallis, Oregon: Oregon State University Press.

Becker and Viers provide a description, primarily for developers and strategists to consider, of physical and social issues related to the utilization of forest thinning materials, specifically from public lands. The authors argue that successful community development may result from a fuels-reduction approach that integrates forest health needs with economic and cultural aspirations. They reason that social acceptability of a utilization project or industry is a cornerstone link to sustainability within the community. Fuels-reduction projects and related community development depend on public perceptions about the following values: property, scenic value, recreation opportunities, watershed protection, and quality of life. Most important to sustainable community development, the authors conclude, is the creation of sustainable employment, which depends on the biophysical and human resources germane to forest-based communities.

Keywords: Forest health, economic opportunities, culture, public perception

Research Approach: Review

3. Lord R., C. Ehlen, D. Stewart-Smith, J. Martin, D.L. Kellogg, C. Davis, M. Stidham, D.M. Penner, and D.J. Bowyer. 2006. *Biomass Energy and Biofuels from Oregon's Forests*. Salem, Oregon: Oregon Forest Resources Institute.

The authors of this report present background on forest bioenergy projects, analyze the feasibility for such projects in Oregon, synthesize public perception, and outline a number of current biomass energy development projects in Oregon and elsewhere. They note that groups in Southwestern Oregon that were interested in biomass utilization projects encountered many barriers, including difficulty in making a profit or getting started due to lack of funds, difficulty for small businesses to compete with larger companies, and transportation costs. Despite these and other barriers, these groups are still interested in utilizing biomass for a wide range of potential societal benefits that include offsetting costs of forest

restoration treatments, providing a boost to the local economy, cleaner air resulting from use of material that would otherwise be burned, and greater energy self-sufficiency. Anticipated benefits of a new 15.5MW power plant on the Warm Springs reservation include the creation of at least 70 new jobs on the materials/production side and the diversification of the local economy by selling excess power generated by the plant to a utility purchaser. There will also be a reduced wildfire risk to the community. The authors conclude that public acceptance is a major challenge to instituting biomass energy development on a large scale in Oregon. They recommend outreach efforts to promote as much public engagement in the process as possible.

Keywords: Public perception, economics, forest restoration, community benefits, public outreach, Oregon

Research Approach: Policy Analysis

4. Stidham, M. 2007. Converting Forest Biomass to Energy in Oregon: Stakeholder Perspectives on a Growing Movement. Master's Thesis. Department of Forest Resources. Oregon State University. Corvallis, Oregon.

In this study, Stidham gathers the perspectives of various stakeholders in Oregon's potential biomass utilization industry development to determine public perceptions, opportunities and barriers, and strategies to overcome the barriers. The author describes the possible opportunities for social benefits from biomass utilization as renewable energy production, healthier forests, and rural economic development. Barriers to development and implementation include supply, lack of suitable market for woody biomass materials, production costs, and social acceptability. Regarding economic development, the author points out that Oregon has many mill sites both active and dormant that are located near forestlands and the electrical grid. These may be suitable for energy production, which would re-energize rural economies recently decimated by the decline of the timber industry and provide well-paying jobs. Increased economic activity would have a stabilizing effect on rural communities, because increased employment would encourage local citizens to stay in the community. Another perceived benefit of biomass utilization efforts involves the collaborative process itself, i.e., communities, agencies, and industry will have to work together to design and implement successful projects that garner public support. This process could have a galvanizing impact on local communities. The author maintains that further education about biomass utilization and building trust between traditionally opposing parties will alleviate the issue of social acceptability.

Keywords: Perceptions, stakeholders, barriers, opportunities, strategies, Oregon

Research Approach: Empirical

5. Upham, P., and S. Shackley. 2006. Stakeholder Opinion of a Proposed 21.5 MWe Biomass Gasifier in Winkleigh, Devon: Implications for Bioenergy Planning and Policy. *Journal of Environmental Policy and Planning* 8:45-66.

This article provides an analysis of a proposed biomass gasifier and public opposition in Winkleigh, Devon. Initial objections to the project related to inadequacies of the Environmental Impact Statement (EIS) to address the plant's impact on the historically and biologically significant landscape. Public perceptions and concerns about the proposed plant include: the plant will function primarily as a large-scale waste-management facility that will have a negative effect on the character of the community; large numbers of trucks with odorous, contaminated biowaste will increase gaseous pollution, noise, and traffic in the community; it will destroy the locals' sense of place in a clean environment and effect

the water supply. Most relevant, however, is the sense from the community that a project of smaller and more local scale would be more beneficial as far as carbon emissions mitigation. They feel it would have fewer negative impacts on the environment because of a smaller area of land needed to support the energy crops that supply a substantial percentage of the plant's fuel. Recommendations for siting future bioenergy power plants include engaging the public early in the process and locating the plants away from residential areas.

Keywords: Bioenergy, planning, public opinion, stakeholder, gassifier, United Kingdom

Research Approach: Empirical

6. Upham, P., S. Shackley, and H. Waterman. 2007. Public and stakeholder perceptions of 2030 bioenergy scenarios for the Yorkshire and Humber region. *Energy Policy* 35:4403-12.

This survey of key stakeholders and comments by focus group members of Yorkshire and Humber, UK shows a common public perception that small- and medium-scale, biomass-fueled, combined heat and power (CHP) and heat are likely to have a greater regional economic and social benefit than biomass-fueled electricity of any scale, especially large-scale centralized developments. Most important to the focus group respondents and stakeholders are the efficiency of CHP and heat relative to electricity; a preference for local use of bioenergy; reduced transportation costs for smaller local projects; enhanced local energy security; and increased local employment. In addition, participants express concern for the visual landscape and prefer to sustain their sense of place when considering the development of bioenergy plants in their region. The authors argue that this study provides pertinent implications for work to be done to improve public perception of biomass-fueled electricity, especially large-scale efforts.

Keywords: Bioenergy, scenarios, perceptions, United Kingdom

Research Approach: Empirical

7. Upreti, B.R. 2004. Conflict over biomass energy development in the United Kingdom: some observations and lessons from England and Wales. *Energy Policy* 32:785-800.

Upreti provides a description and analysis of local reaction to proposed biomass power plants in Selby, Yorkshire, and North Wiltshire, Cricklade, an integrated wood processing plant in Newbridge, Wales, and a straw-burning power plant in Ely, Cambridgeshire. Common public perceptions of proposed development may include the feeling that the development is being involuntarily imposed on the community, the technology is not familiar, the community has been kept out of the decision-making process, and the developers are the only beneficiaries of the project. The author refers to previous studies and argues that siting issues arise when developers and policy makers use utilitarian ethics to justify the location of development infrastructures, focusing solely on the environmental benefits. Local communities in the case studies based their concerns on perceived risks that the developments will increase traffic, have visual impacts on the landscape, and not provide much economic or environmental benefit for the community. In North Wiltshire, for example, the proposed plant was rejected because it was an inappropriate development in a rural buffer that would lead to the deterioration of the rural landscape and the locals' sense of place. In Newbridge, Wales, opponents cited potential negative impacts on tourism, livestock, and visual impacts due to the large scale of the development. The author claims smaller rural communities often agree with the national energy goals of biomass development, but do not wish to host large, loud, odorous facilities. Ultimately, the development of biomass power plants in rural communities requires successful communication between developers, local authorities, and local citizens.

Keywords: Biomass, conflict, energy, public opposition, United Kingdom

Research Approach: Empirical

EQUITY and EXTERNALITIES (3)

1. Cantor, R.A., and C.G. Rizy. 1991. Biomass energy: Exploring the risks of commercialization in the United States of America. *Bioresource Technology* 35:1-13.

Cantor and Rizy conduct a review of biomass literature to assemble a risk assessment for bringing biomass to the commercial market. The assessment breaks risk into several classes, including financial, technical, principal agent, market acceptance, environmental, and public acceptance. Although this article is primarily oriented towards informing biomass program managers of the potential hurdles that biomass commercialization will face, it identifies potential social equity risks as challenges to public acceptance of biomass as commercial resource. These social equity challenges include labor resources, occupational hazards, and competition for land and water resources.

Keywords: Biomass, risk, commercialization, United States

Research Approach: Review

2. Madlenera, R., and S. Vogtli. 2008. Diffusion of bioenergy in urban areas: A socioeconomic analysis of the Swiss wood-fired cogeneration plant in Basel. Center for Energy Policy and Economics, Working Paper 53. Zurich, Switzerland: Swiss Federal Institute of Technology.

According to the authors, the proposed 30MW biomass power plant in Basel, Switzerland, may have important implications for similar projects in urban or semi-urban communities. As an addition to an existing waste incineration facility, the process of siting the Basel plant included sensitivity to traffic, air pollution, and noise concerns, which steered the plant away from residential areas. Employment benefits are not significant and there is no guarantee that the benefit stays within the local community, but construction of the plant and regular maintenance and operation of the facility will lead to some new jobs. The authors contend that two of the major forces behind the project are the desire of forest owners in the Basel region to create large-scale demand for forest residue to improve the cost effectiveness of forest maintenance operations, and, if the plant is put into operation, the entire district heating grid of the city of Basel will be exempted from an anticipated CO2 levy. Overall, a favorable, existing, industrial site for the plant and cooperation between municipal utilities and forest owners has bolstered the process.

Keywords: Urban biomass use, wood energy, cogeneration, socioeconomics, Switzerland

Research Approach: Empirical

3. Miranda, M. L., and B. Hale. 2001. Protecting the forest from the trees: the social costs of energy production in Sweden. *Energy* 26: 869-89.

This study compares the economic and environmental costs of forest residue combustion for energy with fossil fuel-based energy costs in Sweden. Social costs specifically taken into account include production costs, such as operation and maintenance costs, and environmental costs, such as air and water pollution. The study compares the costs related to small and large heating plants, CHP plants, and condensing plants. The authors present environmental costs for Sweden in general and explain how residue removal from

forestlands can lead to groundwater pollution by way of soil acidification due, in part, to the decrease in important nutrients added to the soil through decomposition. Emissions from the transportation of the residues to processing plants, whether by trucks, trains, or ships, are also mentioned by the authors as an environmental and possible health cost of biomass energy development. Specific case studies in Sweden's rural communities are not included in this study, which renders the authors' findings subject to variability, depending on regional circumstances. The authors also explain throughout the article that it is quite challenging to quantify and put a monetary amount next to environmental costs and benefits.

Keywords: Social cost analysis, fuel type comparisons, production costs, environmental costs, Sweden

Research Approach: Modeling

BIOMASS POLICY (3)

1. Farrell, J., and D. Morris. 2008. Rural Power: Community-Scaled Renewable Energy and Rural Economic Development. The New Rules Project, Institute for Local Self Reliance. Minneapolis, Minnesota.

The essential comparative advantage of rural areas is open space. Some communities take advantage of their scenic natural resources. Others tap into their mineral wealth by drilling or mining. Many have economies based on the cultivation of soil. A new and rapidly emerging economic foundation for rural America is the harnessing of renewable energy in its various forms: wind, sunlight, and biofuels. The wind energy industry is growing by 25 percent a year, the biofuels industry by 20 percent. Both are projected to expand three to six times in the next twelve years. These multi-billion dollar industries have already had a significant impact on rural America. Partly as a result of the increased demand for biofuels, for the first time in a generation farmers can make a living selling their crops without government payments. Thousands of landowners are receiving significant revenue from leasing their wind energy rights to developers who use only a tiny fraction of their land. Many landowners own their wind turbines outright. Harnessing renewable energy can dramatically improve the economic prospects of many rural areas. But new rules are needed to maximize the economic and social benefits from these new industries, policies that go beyond more, to demanding better. Current federal incentives largely enable a highly centralized and absentee-owned, renewable energy industry concentrated in relatively few states. The federal government, states, and rural communities should redesign these policies to encourage a highly decentralized and dispersed renewable energy industry that is significantly locally owned. Doing so would multiply the number of rural areas that benefit from burgeoning renewable energy industries and create a sustainable asset whose wealth and revenue will largely remain in revived local communities and regions. This report examines the current impact of renewable energy on rural communities and identifies existing and potential policies that could dramatically expand the economic benefits that this new sector can bring to these communities.

Keywords: Rural energy generation, decentralization, local self-reliance, biomass, wind, solar, United States

Research Approach: Review

2. McKay, H. 2006. Environmental, economic, social and political drivers for increasing use of woodfuel as a renewable resource in Britain. *Biomass and Bioenergy* 30:308-15.

In this article, McKay presents an overview of biomass usage and energy trends in Britain and describes the multiple drivers for increased biomass use. Although the predominant catalyst for increased biomass use is climate change mitigation, the author is careful to mention some social benefits as well. She

explains that one trend in forestry is that farm woodland has increased over the last twenty years. It is estimated that the development of woodfuel markets, particularly on farm woodlands, would provide rural communities with up to a 16% increase in employment, due to jobs related to growing, hauling, and processing the woody material. The author also suggests that cheaper woodfuel-based heating would reduce fuel poverty in areas without access to gas, although she does not divulge how much of the 5 million UK households experiencing fuel poverty would necessarily benefit. It is also argued that on a broad scale, biomass would provide the region with energy security through stability of supply in addition to reduced CO2 emissions from traditional coal-based energy generation.

Keywords: Energy security, rural development, woodfuel, traditional forestry, energy crops, sawmill conversion products, European Union

Research Approach: Policy Analysis

3. Thornley, P., and D. Cooper. 2008. The effectiveness of policy instruments in promoting bioenergy. *Biomass and Bioenergy* 32:903-13.

The author begins by explaining that social implications of bioenergy tend to be broader than for other forms of renewables, specifically impacts on wood-processing industries, agriculture, and rural employment. In Germany, investment subsidies, fixed-price tariffs, and general energy taxes helped to encourage wood CHP and co-firing biomass energy development. Meanwhile, in Italy, a country with less practice than Germany with bioenergy development, investment subsidies targeted at the agricultural sector with technology-blind trading certificates were the most effective policies for fostering bioenergy expansion. In Sweden, a high energy taxation on fossil fuel use has sponsored constant growth of the bioenergy industry. Depending on a country's access to biomass supply, various policies may be more effective than others. In each case, the author examines the use of green certificates, taxation, investment subsidies, and fixed-priced tariffs and concludes that the only consistent tactic to encourage bioenergy development is taxation, as long as it is set at a suitably high level.

Keywords: Biomass, bioenergy, wood, policy, subsidy, tax, support mechanism, Europe

Research Approach: Policy Analysis

SOCIOECONOMIC IMPACTS DISCUSSION and REVIEW (7)

1. Auburn, J., D. Drell, P. Hipple, J. Houghton, and A. Palmisano. 2008. Discussion Paper: Recommendations for Social, Economic, and Environmental Science Priorities for Bioenergy Research, Education, and Extension. *Results of the Joint USDA-DOE Experts Workshop on Bioenergy, Washington, DC, June 21-22, 2007*. Cooperative State Research, Education, and Extension Service (CSREES), United States Department of Agriculture.

This report documents the consensus priorities of the USDA, CSREES and Department of the Energy, Office of Biological and Environmental Research regarding research, education, and extension of sustainable bioenergy. Specifically, the report focuses on social, economic, and environmental implications of bioenergy production. Social priorities and findings include: feedstock production in rural areas will be enhanced if sufficient revenues from processing remain in these communities and help local economic development; to engage small farms systems for cultivating and processing biomass, feedstocks should have scalable components that can be designed to operate at different production levels. One area of concern is the uncertain timescale for analyzing policy impacts and bioenergy production's environmental effects at the community level. The report explains that once a policy has been established, the timescale for creating change in the community as a result of the policy, evaluating community reaction and policy

impacts, and then recognizing or removing regulatory obstacles are highly variable. Biomass feedstock production activities must be mindful not to displace existing land use that provides important ecological services as well as economic goods to the community. Although the report provides little information about particular case studies, it does highlight areas of research and analysis that must take place to better understand the social, economic, and environmental impacts of bioenergy production.

Keywords: Feedstock production, policy, land use displacement, research

Research Approach: Review

2. Mayfield C.A., C.D. Foster, C.T. Smith, J. Gan, and S. Fox. 2007. Opportunities, barriers, and strategies for forest bioenergy and bio-based product development in the Southern United States. *Biomass and Bioenergy* 31:631-37.

Focus groups were used to identify opportunities, barriers, and strategies for increased utilization of forest biomass in the Southern United States. The groups were based on the seven critical components in the bioenergy and bio-based products value chain, as identified by the International Energy Agency (IEA) Bioenergy Task 31 "Biomass Production for Energy from Sustainable Forestry." These components are sustainable biomass production, sustainable forest operations, product delivery logistics, manufacturing and energy production, environmental sustainability, consumer demand, and rural economic development. Participants included handpicked experts from each of the seven component areas. Six common themes emerged from the focus groups. Market creation, infrastructure development, community engagement, incentives, collaboration, and education will all be critical to the successful development of the biomass industry. The forest industry, the energy industry, academia, extension personnel, and rural communities should collaborate to support research, policy issues, and education programs that enhance the efficiency of current forest biomass operations and promote the use of forest biomass for bioenergy.

Keywords: Biomass, forest, education, collaboration, incentives, United States

Research Approach: Expert focus groups

3. Parris, K. 2003. Agriculture, Biomass, Sustainability and Policy: An Overview. In K. Parris and T. Poincet (Eds.) *Biomass and Agriculture: Sustainability, Markets, and Policies*, pp. 27-36. Vienna, Austria: Organisation for Economic Cooperation and Development.

This article is an introduction and overview of the analysis of the potential for bioenergy in a variety of markets. According to Parris, rural socioeconomic development issues from agricultural biomass production include the siting of processing plants near industrial or urban locations for proximity to labor and consumer sources. Difficulties arise in estimating social benefits and costs due to the complex modeling of net effects on farm incomes and rural employment. However, potential benefits of energy security, rural development, efficient use of agricultural wastes, and market innovation drive bioenergy development efforts. Without going into specifics, the author maintains that production and use of biomass can improve quality of life in rural areas, raise agricultural incomes, and connect producers, processors, and consumers on the local level.

Keywords: Biomass potential, social benefits and costs, energy security, rural development, OECD countries

Research Approach: Review

4. Pimentel, D., C. Fried, L. Olson, S. Schmidt, K. Wagner-Johnson, A. Westman, A. Whelan, K. Foglia, P. Poole, T. Klein, R. Sobin, and A. Bochner. 1984. Environmental and Social Costs of Biomass Energy. *Bioscience* 43:89-94.

This article provides a broad overview of social and environmental costs of biomass energy from the perspective of the early 1980s. The article defines biomass broadly to include both agricultural and forest products. The authors identify social issues related to biomass energy production relative to energy production in other sectors, such as gas/oil and coal. Those issues include higher labor requirements (in the field and in plant construction and maintenance), greater occupational hazards in agriculture and forestry, increased land and commodity values, and higher economic costs and opportunity costs for biomass energy compared to other energy sources. The article does not address the potential for woody biomass utilization in the 21st century context of higher nonrenewable resource costs and fuel loading in North American forests.

Keywords: Risks and benefits, resource conflicts, soil erosion, land price inflation, occupational hazards, United States

Research Approach: Review

5. Rajagopal, D. and D. Zilberman. 2007. Review of Environmental, Economic and Policy Aspects of Biofuels. The World Bank Development Research Group, Policy Research Working Paper 4341. Berkeley, California.

This working paper provides a review of historical biofuel use, economic studies, policy implications, and the technological potential of biofuels as a global energy source. When considering the socioeconomic impacts of biofuel production and use, the authors describe both positive and negative effects. They express concern over the potential rise in food costs due to the competition for land use with traditional agriculture, but they also explain that increased demand for biofuel production will increase farm income and viability. Biofuel production is more labor intensive and thus creates more jobs for rural communities. However, an increase in energy crop production would mean an increase in fertilizer and pesticide use, which might have adverse effects on local water quality. In rural parts of developing countries, the use of marginal lands for biofuel plantations can worsen the energy poverty of the landless poor because of the lost access to fuelwood from such lands. Within their review of studies regarding the impact biofuels have on CO2 and greenhouse gas levels, the authors found a lack of attention to issues related to human health, soil erosion, and ecosystem health. The authors conclude that, although there will certainly be winners and losers with increased global biofuel production and use, the losers will likely be "poor net food buyers" and local residents of communities that host production facilities and farms due to pollution.

Keywords: Economics, policy, environmental impacts, social implications, global implications

Research Approach: Review

6. Rakos, C. 2003. Key Factors for the Successful Market Development of Bioenergy: Experiences from Austria. In K. Parris and T. Poincet (Eds.) *Biomass and Agriculture: Sustainability, Markets, and Policies*, pp. 307-14. Vienna, Austria: Organisation for Economic Cooperation and Development.

In this article, Rakos explains how a decrease in wood prices made it increasingly possible for Austrian farmers to convert their agricultural operations to the value-added production of materials to supply biomass district heating plants. Such operations lower local air pollution and provide farmers and rural communities with a source of economic and energy sustainability in an otherwise depressed agricultural economy. A downside to such projects for some community members is the proximity to the noise and

smoke generated by chimneys at the heating plant. The author contends that many district heating projects failed because of poor management of local conflicts involving siting issues. Even so, the article claims that with careful project management and communication, biomass district heating plants can provide rural areas with an innovative, localized, and renewable source of energy.

Keywords: District heating, alternative markets, noise, smoke, conflict, communication, Austria

Research Approach: Review

7. Sims, R.E.H., and K.M. Richards. 2003. The Triple Bottom Line Benefits of Bioenergy for the Community. In K. Parris and T. Poincet (Eds.) *Biomass and Agriculture: Sustainability, Markets, and Policies*, pp. 91-103. Vienna, Austria: Organisation for Economic Cooperation and Development.

This article presents the notion that social and environmental issues ought to be given as much credence as economic issues when analyzing bioenergy development opportunities. According to the authors, social benefits derived from biomass use for rural communities include an improved quality of life, local employment, community ownership of energy or heat production, and social cohesion, all of which could help stem urban drift. Bioenergy development generates employment through construction of facilities and the maintenance and operation of those facilities, including collection and transport of fuels to the plant. The authors site examples of increased employment in Europe due to bioenergy projects, including 4,200 jobs in Denmark, 26,000 in Finland, and 15,000 in Austria, without specifying whether the jobs remain in the communities hosting the projects. On the other hand, the authors explain that specific benefits to communities are difficult to quantify due to a variety of economic, cultural, and regional particulars, as well as differences in each bioenergy development project.

Keywords: Social benefits, employment, community ownership, quality of life, social cohesion, Europe.

Research Approach: Review