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The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support training and research in environmental and resource economics across its 10 member countries: Cambodia, China, Indonesia, Laos, Malaysia, Papua New Guinea, the Philippines, Sri Lanka, Thailand, and Viet Nam. Its goal is to strengthen local capacity for the economic analysis of environmental problems so that researchers can provide sound advice to policymakers.

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Living with Livestock: Dealing with Pig Waste in the Philippines

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As livestock production increases worldwide, livestock waste is becoming a serious environmental hazard. In some cases, the damages have been spectacular and even tragic. In June 1995, the artificial waste lagoon at a hog farm in North Carolina burst. The sudden release of nearly 100 million litres of hog urine and feces polluted neighbouring communities and killed millions of fish in nearby rivers (*Worldwatch*, March/April, 2001). In 2000, drinking water contaminated by livestock waste led to several deaths in the small Canadian town of Walkerton. →

A summary of EEPSEA Research Report 2001-RR6, *Backyard and Commercial Piggeries in the Philippines: Environmental Consequences and Pollution Control Options*, by Ma. Angeles Catelo, Moises A. Dorado, and Elpidio Agbisit, Jr., Department of Economics and Management, University of the Philippines Los Baños, College, Laguna 4031, Philippines (les@laguna.net)

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Odours are but one problem *health and ecosystems also suffer*

➔ In other cases, livestock waste causes continuous and pervasive damage to people's health and the environment. Such is the situation in the Philippines, according to a recent EEPSEA-supported study. In response, the study team investigated a number of solutions and highlighted those that could mitigate the problem — given adequate support from policymakers.

The study was undertaken by a team from the University of the Philippines Los Baños, led by Angeles Catelo. They conducted their research in the municipality of Majayjay in the province of Laguna. This province ranks fourth in terms of backyard hog production and third in commercial hog production in the Southern Tagalog Region. The research took place against a background of increasing disquiet over the impact of hog

raising. In particular, residents from the municipality of Tarlac have complained bitterly about the stench and environmental impact of piggeries which, they claim, have contaminated ground water and led to disease outbreaks.

Moreover, it is clear that current pollution regulations have had little effect on backyard operators. This depressing situation has been attributed to a lack of political will for enforcement and a lack of funds to pay for pollution control. But it also reflects the economic importance of livestock raising. Backyard operations are an important source of income for low to middle income Filipinos; if control measures are so costly they would curtail this business, it would cause real hardship.

To find out the actual situation on the ground, the researchers looked at both the on-site and

off-site impacts of hog farming in Majayjay. 176 households were surveyed, including 82 households of swine raisers and 94 households that live within a 20-metre radius of a hog farm. An additional comparative survey was made of 50 households that were not affected by air pollution from the farms.

Odours Accompany Airborne Diseases

Catelo and her team found that 70% of households near piggeries said that they were affected by odour from pig wastes. The most common health effects were those related to respiratory diseases such as asthma, bronchitis and pneumonia. Ailments such as diarrhea, influenza and skin allergies were also reported. Households near backyard piggeries suffered an average of PHP 15,640 per year in health damages due to asthma and 15,220 for bronchitis.* Although not all of this is attributable to the piggeries, a comparison between people who suffer the odours from pig waste and those who do not showed that the illness is higher in those places where smells are a problem.

* 45 PHP = 1 USD.

Water Bodies Have Become Unusable

Eighty percent of the backyard and commercial farms in the region deposit their waste products into local creeks and rivers. For the sample of 91 farms, total manure production per year was about 672 tonnes. This means that the entire swine population of Majayjay produce about 6,900 tonnes of manure a year. An evaluation of the characteristics of the waste water from hog farms and affected surface waters showed that these do not pass the standards set by the Department of Environment and Natural Resources even for Class C waters.

The majority of respondents agreed that the direct dumping of piggery wastes has caused most rivers and creeks in Majayjay to become polluted and emit foul odours. Older residents claimed that the quality of water had deteriorated since pig farms came into the region and that rivers, which once provided drinking and bathing water, fish and recreation, now were polluted, cloudy and malodourous.

A watershed approach to pollution loading was adopted to establish whether reducing pig wastes would indeed improve environmental quality. The researchers concentrated this analysis on the river network that traverses Majayjay. Different activity zones within

the watershed were identified and their respective contributions to pollution were estimated. They found that the animal waste discharges by backyard and commercial piggeries and poultry farms contribute a substantial amount to river pollution. They also established that dealing with this pollution source would go a long way to improving the quality of the Pagsanjan/Lumban River system and the nationally important Laguna Lake it

feeds. The lake is used for fishing, irrigation, power generation, transport and navigation; its feeder rivers are the target of a multisector rehabilitation project by the Laguna Lake Development Authority (LLDA).

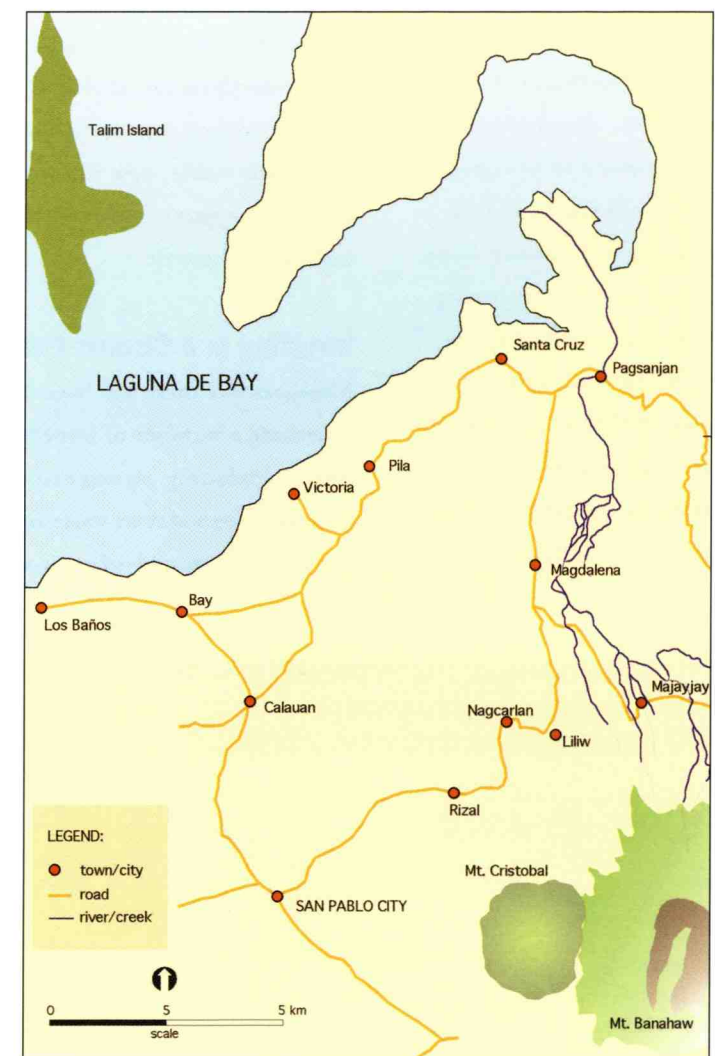
Reducing Waste at Source

Once they had determined the scope of the problem and the need for action, Catelo's team then investigated what could be done.

Economic analysis of pollution control costs

Option	Pollution reduction		
	6.3%	25%	50%
	Investment cost (million PHP)*		
Bio-gas: Backyard	1.8	—	—
Bio-gas: commercial	2.3	9.2	18.4
Organic fertilizer/pelleting plant	0.5	2.0	4.0
	Annual operating and maintenance cost (thousand PHP)*		
Bio-gas: backyard	358	—	—
Bio-gas: commercial	116	464	928
Organic fertilizer/pelleting plant	892	3,570	7,140

*45 PHP = 1 USD.





Because water is free of charge to households in Majayjay, farmers use, on average, 30 litres of water per head of swine per day — three times the recognized technical minimum requirement of 10 litres. While this does dilute pollution discharges, it also increases the amount of water that needs to be treated.

The researchers looked at two approaches to dealing with this situation — reducing pollution at source and treating it once it had been produced. In order to assess the political, institutional and commercial acceptability of these options, the researchers talked to barangay captains, hog raisers, the municipal council and the mayor. They also conducted an informal discussion with the chief and staff of the Community Development Division of the LLDA. Among the measures to promote waste reduction at source were market-based instruments such as pollution taxes, user fees and proper water pricing. Currently, people in the municipality are charged — at most — a minimal rate of PHP 10 per month and water is not metered. Having had considerable success in raising general awareness of pollution

issues in their discussion sessions in the municipality, the researchers also suggested an information and education campaign. Such campaigns could talk about practices like changing the components of livestock feed to produce less pollutive wastes.

End-of-Pipe Options

Although Catelo and her team emphasized the need for pollution reduction at source, they also suggested various end-of-pipe treatment options, such as the construction of lagoons (for those with available land); installation of bio-gas digesters (twin sharing for backyard raisers that are close to each other); and construction of an organic fertilizer/pelleting plant. The researchers found that all these control options were technically and financially viable, with the commercial bio-gas system yielding the highest net benefit.

Investing in a Cleaner Future

Measures like these will have to overcome a number of impediments, including strong resistance to paying for water or waste treatment. From an end-of-pipe stand-

point, similar problems exist. The use of bio-gas or pelletized organic fertilizer, while shown to generate high economic returns, still has to be actively promoted, since hog raisers have to be convinced of its profitability. Moreover, since waste treatment regulations are not strictly enforced, there remains little incentive for farmers to invest the money or time need to change to new technology.

On a more positive note, the results of the financial and economic analyses indicate that the construction of consolidated treatment facilities should be an attractive option for commercial investors — possibly a public-private consortium. Another way to get pollution control technology in place would be subsidize the investment cost through credit schemes, tax incentives, donations or the lease of land.

Whatever mechanisms are used, Catelo and her team emphasize the pressing need for local government units, business entities, and households to come together to make the cleanup a reality.

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