

Recovery of Copper & Gold from Waste Electrical & Electronic Equipment
(Technical Report)

Human Preference vs. Animal Welfare: Canine Ear Cropping and Tail
Docking
(STS Research Paper)

An Undergraduate Thesis Portfolio
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by

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Preface

How are human convenience and preferences weighed against environmental welfare? Even environmental values may be in competition with each other. The underlying issue is likely not *if* the environment should be valued but rather *how* the environment should be valued.

Waste electrical and electronic equipment (WEEE) includes copper and gold. Most WEEE is not recycled and is squandered in landfills. The research team designed a process by which copper and gold may be recovered from WEEE, reducing waste and yielding nonrenewable precious metals. Four major blocks compose the proposed process: Block A gasifies the plastic parts of WEEE into syngas and processes the leftover metals; Block B recovers copper via agitated leaching, solvent extraction, stripping, and electrowinning; Block C recovers gold via agitated leaching, adsorption and elution of gold on activated carbon, and electrowinning; and Block D converts the syngas into power. According to the team's theoretical analysis, the process would treat 181.5 kt/a WEEE and recover 31.9 kt/a copper and 0.151 kt/a gold. The startup costs would be more than \$17 million, and the non-discounted yearly cash flow would be about \$3.4 billion and could return a profit within as little as one year after construction. The revenue yields a high internal rate of return of over 9,500%. From an environmental and economic perspective, this process is attractive, but has major safety implications that must first be addressed.

How do advocates and critics of canine cropping and docking (C&D) defend their agendas? The debate around C&D persists because there is no settled definition of animal welfare, which depends in part on human values. Advocates usually include dog fanciers, breeders, owners, and select veterinarians, who value C&D as a matter of authority and as an

artform. Critics usually include humane societies, veterinarians, legislators, and journalists who consider C&D to be a cruel mutilation. Most involved value animal welfare, but because they define it differently, both parties will talk past each other until the focus shifts from the merits of C&D to the definition of animal welfare.

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