

## Public Awareness of Environmental Policies in Bhutan

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### **Abstract**

Conservation of the natural environment is a national priority in Bhutan, and the government has developed several policies to help safeguard the environment, though success of the policies requires citizen participation and awareness. Numerous agencies have recognized the importance of spreading environmental awareness, but despite the dissemination of information through awareness campaigns and media, no follow up studies have been conducted to determine whether citizen awareness has indeed increased. This case study assessed the level of public awareness of key environmental policies via surveys of citizens throughout Western and Eastern Bhutan using questionnaires, as well as interviews of local leaders and key policy makers. The results indicate that self-rated public awareness of key environmental policies is moderate across sectors for the Forest and Waste Management acts, but low for the more recent Water Act. Awareness varies slightly for different acts depending on various demographic factors: location, sex, age, and educational level. Confidence in public compliance with the acts, or whether enough is being done to spread awareness, varies inversely with level of education. Preferred ways of receiving information differ by sectors. Therefore, techniques for spreading awareness can be tailored depending on the target sector, and dissemination of information through single means should be avoided. Print news media and internet show limited potential till date, while radio is more popular. The results should help inform policy makers such as the National Environment Commission and the GNH Commission, as well as non-governmental organizations on status of their efforts to promote public awareness of environmental policies.

### **Introduction**

Environmental conservation has been a top priority in Bhutan since the start of development planning in the 1960s (reviewed in Phuntsho, 2011). Within Bhutan's guiding development philosophy of Gross National Happiness (GNH), one of the four major pillars is conservation of the environment (Ura, Alkire, Zangmo, & Wangdi, 2012). The Royal Government of Bhutan (RGoB) has developed several policies and regulations to help safeguard the environment and to equitably distribute the benefits of natural resources. The first law passed by the National Assembly was the Forest Act of 1969, which set the stage for state management and conservation of the nation's forests (Phuntsho, 2011; Royal Government of Bhutan, 2010). Since then, increasing numbers of stakeholders have participated in formulation of environmental policies and laws. Moreover, RGoB has committed to at least a dozen international environmental treaties/agreements, such as the UN Convention on Biological Diversity (National Biodiversity Centre, 2009), and the fundamental elements of these agreements have generally also been incorporated into Bhutanese law.

However, for conservation and sustainable development efforts to succeed, citizen participation and awareness are critical. It has been well recognized that effective environmental policy making and implementation rely not only on a framework based on sound science, but also heightened public awareness regarding environmental issues (Lee, 2010). In countries such as the USA, where pollution and environmental deterioration had already occurred, improvements in environmental conditions resulted not only from the actions of individuals and organizations but also with growing public awareness of critical environmental issues (Rockwood, Stewart, & Dietz, 2008).

In Bhutan, it is every citizen's duty to help protect the environment. The Constitution of Bhutan, Article 5.1, states that "Every Bhutanese is a trustee of the Kingdom's natural resources and environment for the benefit of the present and future generations and it is the fundamental duty of every citizen to contribute to the protection of the natural environment, conservation of the rich biodiversity of Bhutan and prevention of all forms of ecological degradation including noise, visual and physical pollution through the adoption and support of environment friendly practices and policies" (Constitution Drafting Committee, 2008). Hence, it is important that the citizens of Bhutan are aware of existing environmental policies and regulations.

Media and other NGOs have historically led the way in promoting public awareness on these issues. The mass media are influential for widening public awareness of environmental issues, and sustained media coverage can impact public concern about an issue (Sampei & Aoyagi-Usui, 2009). Government bodies have increasingly taken on more proactive roles (Rockwood, et al., 2008). In fact, in addition to being policy making and implementing body, Bhutan's National Environment Commission aims to "Promote environmental awareness amongst all levels of Bhutanese society, including dissemination of environmental policies, strategies, acts, rules, regulations and standards through print, audio visual and other appropriate means" (National Environment Commission, 2012a).

Nevertheless, the desire to promote better awareness does not necessarily mean it is happening successfully. For example, most public opinion research in the USA finds that the public is concerned about environmental problems and generally supportive of strong public policies, yet at the same time is not well informed on the issues (Kraft, 2011). The situation in Bhutan is probably similar: A 2004 Country Environmental Analysis conducted by the Asian Development bank concluded that despite NEC awareness workshops and trainings, environmental compliance and public awareness on environmental policy was generally low, finding the people have "low public awareness of their own rights and duties as well as their responsibility to obey laws, legal requirements and regulations" (Sewell, 2004). Since then, the NEC and several other organizations (World Wildlife Fund Bhutan, Royal Society for the Protection of Nature, United Nations Development Programme, Kuensel Corporation, Bhutan Scouts Association, various student groups, and even tourist groups) have launched awareness campaigns across the nation promoting environmental awareness. However, it is not clear how effective these campaigns have been in raising public awareness of environmental *policies*, as opposed to general environmental awareness, and no formal assessment of the level of environmental policy awareness has been conducted in recent years.

The level of awareness on environmental issues generally follows the same pattern as awareness on other matters, i.e., it is typically greater in more developed areas and correlates positively with level of education. For example, the level of Bangladeshi farmers' awareness regarding the negative effects of using Green Revolution technology was found to vary in correlation with their level of education and their location in more developed regions of the country (Rahman, 2010).

This study sought to assess the level of public awareness of key environmental policies in urban and rural populations in Bhutan, as well as possible correlating factors. We also sought to determine preferences of different target populations for various types of media for acquiring information. It is anticipated that the study findings will help governmental and non-governmental agencies fine tune their approaches for effectively disseminating information about and promoting awareness on environmental policies that may directly or indirectly affect the nation's citizens.

## Materials and Methods

### *Environmental Legislation in Bhutan*

For this study we analyzed awareness of three environmental laws in Bhutan: Forest Act, Waste Act, and Water Act.

The term “Forest Act” is used here to refer to the various laws regarding forests in Bhutan (Royal Government of Bhutan, 2010). The Forest Act of 1969 declared that all forests belong to the State, allowing for no private rights to any part of them. This guided the 1974 Forest Policy for scientific management of the country’s forests that included provisions for conservation, afforestation, resource survey, utilization, and wildlife conservation. This was also the first mention of minimum 60% forest cover requirement. The Policy was replaced by the Forest and Nature Conservation Act of 1995, which further strengthened scientific approach to forest governance and management, including policies on soil conservation, protected areas, and protection of wildlife. It recognized traditional and cultural rights of local people to access and use of forest resources, allowing for private and community forestry. The most recent policy statement on forests is the National Forest Policy, 2010 (Royal Government of Bhutan, 2010).

The term “Waste Act” refers to the Waste Management and Prevention Act, 2009, which seeks to prevent and reduce amount of waste and promote reuse, recycle and management of waste in an environmentally sound manner. It implements the polluter-pays principle through the Waste Prevention and Management Regulation, 2012 (NEC, 2012).

The term “Water Act” refers to the Water Act, 2011. It ensures that water resources are protected, conserved and/or managed in an economically efficient, socially equitable and environmentally sustainable manner. All water resources are declared as State-owned trust, available at the individual level for meeting basic human needs (National Environment Commission, 2012b, 2012c).

### *Interviews*

Apart from 858 respondents we also interviewed various Government and NGO officials who played a role in formulation of environmental policies, acts and regulations. Interviews were done face-to-face, by phone, or by e-mail between December 2011 and April 2012. We interviewed officials from National Environment Commission (NEC), Gross National Happiness Commission (GNHC), Royal Society for Protection of Nature (RSPN), Ministry of Agriculture and Forest (MOAF), Bhutan Trust Fund for Environmental Conservation (BTF), Gups (village/town heads), Environmental officers and other officials potentially responsible for helping in implementation of environmental laws / dissemination of information. We asked the roles each agency played and how they contributed for the formulation of policies and acts. We also asked about the methods each of them employed to disseminate the information and how each of these agencies evaluated the level of public awareness of policies and acts.

### *Surveys*

The data for the present study was collected by conducting a face-to-face survey in Bhutan with participants from households and workplaces, between December 15, 2011 and February 15, 2012. Convenience sampling was employed to get the responses. Geographically, we divided Bhutan into

Western and Eastern regions, so the survey effectively represents a case study of these areas and cannot formally be declared a representative national study. The total sample size collected was  $N = 858$  respondents of which 50% were male and 50% were female, 51% were from the Eastern part of Bhutan (total 438 from Lhuntse-5, Mongar-168, Trashigang-182, and Samdrup Jongkhar-83) while 49% were from the Western part (total 420 from Chukha-40, Gasa-29, Paro-75, Punakha-100, Thimphu-99, and Wangdue Phodrang-77). Urban respondents constituted 58% of the sample, while rural respondents constituted 42%. Since Bhutan is predominately rural (~70%)(Office of the Census Commissioner, 2005), our aggregate sample is not representative of the national population, so we disaggregated the data rural vs. urban in most cases, such that internal comparisons between the two samples are still valid. The rural vs. urban determination was made by surveyors by judging whether the respondents' daily routine included primary (rural) or non-primary (urban) activities more than half the time, along with guidance from the Ministry of Works and Human Settlements. Respondents were all 18 years and above.

We first asked the respondents their age and their level of education. We also asked them the facilities available to them (access to newspaper, TV, radio, roads). For the awareness survey, we started off by asking if they thought laws protecting the environment were important. We then asked them whether they aware of the existence of environmental laws and policies. If the respondents responded "Yes" we asked them to state one and continued with the interview. If they stated "No" then we jumped to the end of the interview and asked them if they thought enough was being done to spread awareness of existing policies and acts what ways they thought would be most helpful for disseminating the existence of such information.

For those respondents who said that they were aware of the existence of environmental acts we further asked them to grade themselves on their level of awareness of three acts (Forest Act, Waste Act, and Water Act). For each act, the respondents had to rate themselves on the familiarity scale marked 0 to 10, with 0 meaning "Not at all", 5 meaning "Somewhat", and 10 meaning "Very familiar". We also asked the respondents to grade as to how well they thought the public is complying and following the acts. They were asked to grade this on a familiarity scale of 0 to 10 (0 meaning "Not at all", 5 meaning "Somewhat", and 10 meaning "Very well"). At end of the survey we asked respondents if they think enough is being done to spread awareness of existing policies and acts. We also asked them to note/choose, in their opinion, the most effective way of better spreading awareness of the environmental acts.

The data were analyzed using standard statistical methods in SPSS. Where significant differences between sectors are pointed out in the text, the level of significance was stronger than  $p \leq 0.01$  except where specifically indicated otherwise. The effect size is given by "r" where appropriate.

## Results and Discussion

### *The stakeholders involved in formulation and implementation of environmental policy*

Based on our interviews, we verified the positions of a variety of key stakeholders in the environmental policy process. The National Environment Commission is the high-level autonomous agency of the Royal Government of Bhutan and is mandated to look after all issues related to environment in Bhutan (National Environment Commission, 2012a). NEC was formed in 1990 (National Environment Commission, 1998). Before NEC became the regulatory environment body, the Ministry of Forests and Agriculture

took care of environmental policies and laws. The long term objectives of NEC include formulation and implementation of policies, plan and actions for the sustainability of Bhutan's natural resources. The environmental policies are formulated based on the current, emerging and potential environmental issues that need guidance and directives (personal communication, NEC officials). GNHC is a body responsible for screening all official policies in Bhutan. All policies must be reviewed by the GNHC commission before endorsement by the Cabinet. All policies that will be sent to the Parliament have to follow the "protocol for policy formulation" (personal communication, Phuntsho Wangyel, GNHC).

Other stakeholders like RSPN, WWF, UN, BTF and a few other non-governmental organizations, apart from helping in formulation process, also fund and encourage research on environment. They, however, have no enforcement power. These agencies collaborate with the Ministry of Education and others to inform school environmental curricula, and to conduct workshops, campaigns and trainings to help raise awareness of environmental issues. For e.g, RSPN encouraged schools in Bhutan to come up with nature clubs, and developed modules for school as well as non-formal education that include environment components (personal communication, Dr. Lam Norbu, RSPN).

The modes of communication used for the dissemination of information on various environmental acts and policies are media, awareness campaigns, workshops and trainings. Local leaders are made aware of environmental policies through their own initiatives as well as during DYT (district-level governing body) and GYT (town-level governing body) meetings (personal communication, various Gups). The environmental officer of different Dzongkhags allocates funds to their respective constituencies to organize village gatherings and promote awareness. These gatherings are important since "most people cannot read so we depend on environmental awareness campaigns." (personal communication, environmental officer from an Eastern Dzongkhag).

At the village level, there is no specific organization or focal agency to monitor the compliance of all environmental policies, though there may be a regional forest office to monitor forestry in some communities. Mostly, the local government officials are the ones ensure that the villagers comply by these policies (personal communication, various Gups). According to one Gup, the rural population now seems to be more interested in learning about the existing environmental acts and policies than in the past. Specifically, the Gup noticed that the people of his gewog were more frequently coming forward with questions regarding environmental laws. The questions were mostly related to the penalties and fines if they fail to abide the laws and regulations (personal communication, Deothang Gup). However, in other villages the scenario is different. Most of the other gups interviewed pointed out that the villagers rarely had questions regarding environmental acts (personal communication, various Gups). The situation throughout the country therefore seems to be highly variable regarding citizen interest and awareness regarding the acts.

### *Public awareness of environmental laws*

Despite the activities of NGOs, schools and other government bodies helping in the implementation of the environmental policies and laws, no study has been conducted to evaluate the public awareness of environmental policies in Bhutan. A reasonable assumption is that if people are more aware about the existing environmental policies and acts and why they exist, then environmental protection will be carried out in a more successful way. This study sought to assess the level of public awareness of key

environmental policies in urban vs. rural populations, between different demographic sectors such as by sex, education, age, and availability of facilities. We also sought to assess the level of awareness of older policies vs. newer environmental policies. Rather than serve as a representative national survey, our work can best be considered a case study of Western and Eastern dzongkhags (districts) in the country.

We were first interested in knowing what facilities our respondents had access to. Survey participants were asked if they regularly had access to newspapers, TV, radio, and roads (within 15 minutes walking distance). Most respondents were able to avail TV and radio and lived near roads, but the urban population had better access to newspaper and TV (Fig. 1). In fact, only 20% of rural respondents regularly accessed newspapers.

We next asked participants directly whether they felt laws to protect the environment were necessary. Not surprisingly, nearly everyone (97% of respondents), whether they were rural or urban, felt such laws were needed.

However, when asked directly (Yes/No) if they were aware that such laws exist in Bhutan, only 53% of our respondents said “Yes”. Breaking this down by sector, we found a greater proportion of rural people stating that they were aware of such laws as compared to the proportion within the urban population (66% vs. 52%, respectively) (Fig. 2). This was also the case of Easterners vs. Westerners (62% vs. 53%, respectively). Perhaps this is not surprising because the Eastern population is more rural (and correlated as such in our sample). As indicated below, the greater overall level of rural awareness of the existence environmental laws was probably due to their familiarity with the Forest Act, as it directly impacts the livelihoods of many rural communities.

Our analysis also showed that Males were more likely to respond positively than Females (64% vs. 52%, respectively) (Fig. 2). This might be because many community leaders often disseminate information through community meetings, and generally just the head of the household attends (personal communication, various Gups). There were no significant differences for this yes/no awareness metric between different age groups or people of different educational backgrounds.

Amongst the subsample of respondents who had answered “Yes”, they had heard about environmental laws, we asked what were their sources of that information, whether news media, friends or family, workplace or school, community meetings, or other sources. Many rural and urban respondents had heard about environmental laws from news media (61% and 66%, respectively) (Fig. 3). Some got information through town/community meetings (more so in the rural population – 47%, vs. 22% of urban respondents). This matches our interview data where we learned rural community leaders preferred face-to-face or audio/visual communication among their constituents. However, amongst friends and family, communications regarding environmental laws were more prevalent among urban than rural respondents (16% vs. 5%, respectively). Workplaces and schools were also a source of awareness for both rural and urban respondents (17% and 21%, respectively).

Those respondents who had answered “Yes”, they had heard about environmental laws, were also asked directly to name one such law. Generally, people gave responses that were not necessarily the name of the act, but were indicative of some of the provisions covered by the acts, for example “a permit is required for cutting down trees”. We categorized their responses according to whether the responses correctly mentioned either the Forest, Waste, or Water Acts directly, or mentioned key provisions thereof (Fig. 4). When we grouped the responses by which act they could be classified under, we found that most



people had some awareness of provisions of the Forest Act and Waste management act, but very few stated something related to the Water Act.

Most (53%) of the people from the rural sample identified the Forest Act as the first one they could name, whereas only 40% of the urban respondents did so (Fig. 4). This is as expected, as the people living in rural areas mostly rely on the forest for their income and there is often a presence of forestry officers in rural communities (personal communication, various Gups). Moreover, the community forestry programme in Bhutan targets mostly rural populations, and participation in this has been steadily increasing since 2000 (Temphel & Beukeboom, 2006).

Waste management is more of a problem in urban areas, and urbanites mostly identified the Waste Act (Fig. 4). Solid waste has been increasing in urban areas; in Thimphu, Memelakha landfill is over-capacity, and there has been an increase in industrial, medical, and e-waste (National Environment Commission Secretariat, 2008; Wangchuk, 2011).

Based on the results depicted in Figure 4, we can also discern the difference in awareness depending on how old the acts were. In one form or another, Bhutan has had Forest Acts for over 40 years, whereas the Waste Act was introduced in 2009 and the Water Act only six months before the survey was conducted. As expected, people have greater awareness of older acts (Fig. 4), but in the case of the Waste Act, though it was only 2.5 years old at the time of the study, it was enacted with provisions which mandated that awareness of the act should be heavily promoted. It seems as though this has resulted, in a short amount of time, in a level of awareness as high as the much older Forest Act.

To get at this more precisely, participants were asked to rate their level of familiarity with the acts on a scale of 0 (being no familiarity) to 10 (being high familiarity). The results were analyzed as distributions of the ratings given by the respondents (Fig. 5). For the Forest and Waste Acts, we observed a fairly normal distribution, with some skew towards the lower end. However, for the Water Act, we noted there was split in the distribution. Some portion of the responses was similar in distribution to the other two acts, but there seemed to be a large number of respondents that stated they had zero awareness of the Water Act, which made it a non-normal distribution. To look at the mean ratings, therefore, we excluded the zero responses (Fig. 5, right). From this, the mean ratings calculated along with pair-wise t-test comparisons among all three acts. Essentially, these distributions excluding the zero values are the sub-sample of our respondents that had some awareness of all three acts (which is 204, or 24% of our total sample). The analysis shows statistically significant but minor differences in familiarity between the three acts, with the Water Act having the lowest ratings, keeping in mind all those who had zero familiarity were excluded. If we had included them the mean would have been much lower. The findings that (1) when people claim some familiarity with the Water Act, it is at an average level, similar to their level of familiarity with the other two older acts, and (2) there are many people who have no familiarity with the Water Act, indicate that level of awareness of environmental laws may nearly reach its peak the first time people hear about such laws, and not increase substantially after that.

Breaking the total awareness data for each act down by sector, we found that for the Waste Act, there seemed to be greater familiarity in urban than rural populations ( $p < 0.05$ ,  $r = 0.16$ ) and those at higher educational levels ( $p < 0.001$ ,  $r = 0.15$ ). Familiarity with the Forest Act was greater among Easterners than Westerners ( $p < 0.001$ ,  $r = 0.39$ ). Finally, familiarity with the Water Act correlated positively with age ( $p < 0.001$ ,  $r = 0.21$ ). We found that there was no correlation between self-rated familiarity with the different acts and gender.

If we combine the total familiarity self-ratings for all three acts and see how this varies with different factors, we find that overall there is a significant correlation with age ( $p < 0.001$ ,  $r = 0.22$ ), that there is greater familiarity in rural respondents ( $p < 0.001$ ,  $r = 0.19$ ), but no further correlation with level of education, gender, or geographical location.

We next asked survey participants how well they thought the acts were actually being followed (in other words, their opinions on public compliance with the acts), on a scale of 0 (not at all) to 10 (very well). The responses were analyzed as distributions along with the means and pair-wise t-tests (Fig. 6). Respondents felt that the Forest Act was being followed at a somewhat moderate level, followed by the Waste Act, whereas they felt there was probably least compliance with the Water Act.

Again, breaking the total data down by sector, for all acts we found that there was positive correlation with age, meaning that older respondents tended to feel there was greater public compliance with the laws whereas younger people may have been more skeptical (data not shown). For all acts, Easterners and those with less education felt there was greater compliance with the laws than Westerners and those with greater education (data not shown). Rural respondents felt there was greater compliance with the Forest Act than urban respondents ( $p < 0.05$ ,  $r = 0.11$ ).

### *Public opinion on enhancing awareness of environmental policies*

Regardless of whether survey participants responded “Yes” to having knowledge that environmental acts existed in Bhutan, all participants were asked whether they thought enough is being done to spread awareness about environmental acts (Yes/No). No difference between rural and urban populations was found here: On average, less than half of respondents stated “Yes” (enough was being done to spread awareness), but the other half was either “Not sure” or stated “No” (Fig. 7). There were no significant differences between Males/Females or Easterners/Westerners, or any correlation with age, but interestingly, those with higher educational backgrounds were more likely to think “No” (not enough was being done to spread awareness) or were “Not sure”, than those with no education or just primary education, who tended to respond “Yes” by much greater margins.

Next, thinking about what might be the best way to spread information about environmental acts, we asked people directly what they felt the single best way would be, in their opinion, when asked to pick only one option (possible choices were newspaper, TV, radio, internet, community centers/notice boards, awareness campaigns, or other). Notable findings were observed when the results were segregated rural vs. urban, by level of education, and by age (Fig. 8A). People from both rural and urban sectors favored TV and awareness campaigns – slightly more among the urban population, though rural respondents had a more clear preference for radio than the urban respondents. Very few seemed to think that newspapers or internet were the single *best* ways of spreading awareness.

By the level of education, those with *some* schooling (any schooling, primary or higher) strongly favored TV and awareness campaigns, whereas those with no schooling at all were more evenly split between TV, awareness campaigns and radio, with a significant fraction also favoring community centers (Fig. 8B).

By age, those few individuals who favored newspapers or internet were the younger populations, as depicted in the box plots represent age distributions of respondents favoring particular options (Fig. 8C). Radio has the greatest spread and longest top whisker here, indicating some preference for radio by people of all ages, including the oldest crowd.



## Conclusions

The results of this study suggest that self-rated public awareness of key environmental policies is moderate across sectors for the Forest and Waste Acts, but low for the more recent Water Act. The awareness is greater for older acts, but may peak within 2-3 years. Although the Forest Act has been around for decades, people did not claim to have very strong familiarity with it. Therefore, awareness levels may reach their maximum possible within just a few years. However, perhaps awareness of the Waste Act will continue to rise and overtake awareness of the Forest Act because of its intensive publicizing. Mass media was brought into Bhutan much later than most of the rest of the world. With the introduction of radio in 1973, newspapers, television in 1999 and internet in the 2000s, more avenues have become available for the dissemination of information to the general public.

One reason why the Waste Act is as well-known as the Forest Act, even though the Forest act is much older, could be because of the media attention that Waste issues get in Bhutan. We conducted a preliminary analysis through archives of the nation's oldest and widest reaching newspaper, Kuensel. Indeed, Waste- and Forest-related environmental coverage was roughly equivalent, and generally more prevalent than Water-related coverage (data not shown). Intriguingly, some of the media analysis indicated a recurring pattern for certain environmental issues, indicating that, while the media was disseminating information relevant to the issues, problems still persisted. For example, coverage of the plastic ban in Bhutan showed a cyclical pattern of articles about policies to toughen the ban followed periodically by coverage or analysis about how the ban has been ineffective.

Awareness varies slightly for different acts depending on various demographic factors: location, sex, age, educational level. For the Forest Act, there is greater familiarity in Eastern Bhutan. For the Waste Act, there is greater familiarity among the urban populations as compared to rural populations, and familiarity increases with higher educational level. For the Water Act, there was found to be a positive correlation with age. The total self-rated familiarity for all three Acts shows a significant correlation with age, and is greater in rural than urban populations. Together, the data should inform what target sectors could best benefit from added attention from those seeking to raise awareness about the Acts.

Confidence in public compliance with the acts, or whether enough is being done to spread awareness, varies inversely with level of education. It seems that the more formal education people have been through, the more likely they are to be skeptical about compliance with environmental laws. We found that the preferred ways of receiving information differed by sectors, so the techniques for spreading awareness can and should be tailored depending on the target sector. However, generally speaking, dissemination of information through single means should be avoided. People do not seem to be favoring print news media or internet much, yet (as the single best option); instead they tend to prefer audio/visual modes of media, with TV and radio showing the broadest reach across sectors. Direct communication is also an effective means: awareness campaigns and community-based methods (meetings, community centers) are still popular.

Our findings matched well with previous analyses of the media situation in Bhutan, with a 2008 study showing that while newspaper was the least popular medium, radio was the most popular, and actually increasing in its reach (Department of Information and Media, 2008). In fact, the largest broadcaster, Bhutan Broadcasting Service, launched an additional fully national language (Dzongkha)

channel in February, 2013. A recent media baseline study also confirmed the wide reach of radio, but highlighted that there was still an urban-centric bias in the issues covered (Bhutan Media Foundation, 2012). The implication is that radio is a medium with some as-yet untapped potential to enhance environmental awareness throughout all sectors of society.

This study has certain limitations, most importantly that using an opinion survey does not guarantee accurate assessment of respondents' actual true knowledge of the issues and laws – this might require a test or quiz of some kind to determine properly. Next, it should be kept in mind that we cannot use these findings as predictors of people's real-life behaviors – even those with great knowledge of environmental laws might still be likely to violate them. We therefore recommend further studies focusing on environmental *knowledge* and responsible environmental *behavior* (actual compliance with the laws). Then, these two variables, knowledge and behavior, can be correlated with demographic factors such as location, sex, age as well as what facilities those people have access to. This should help in further determining the most effective ways of disseminating information in order to achieve greater compliance with environmental acts.

### Acknowledgements

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### Figures

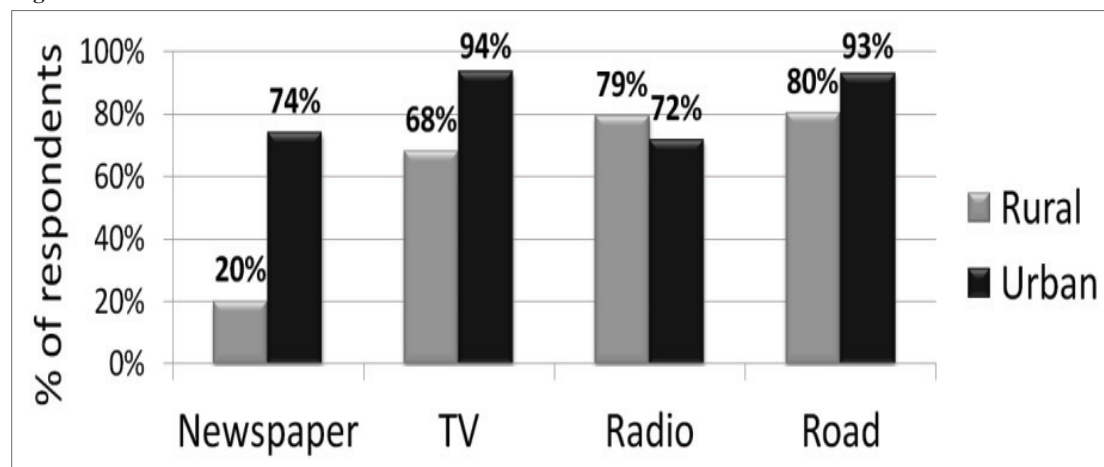


Figure 1. Access to facilities. Survey participants were asked to indicate all facilities they had access to on a regular basis. Road access was defined as availability of a motorable road within 15 minutes walking distance. Responses from Rural and Urban sectors were segregated as indicated. Bars represent the percent of respondents, from either sector, that had access to the indicated facility.

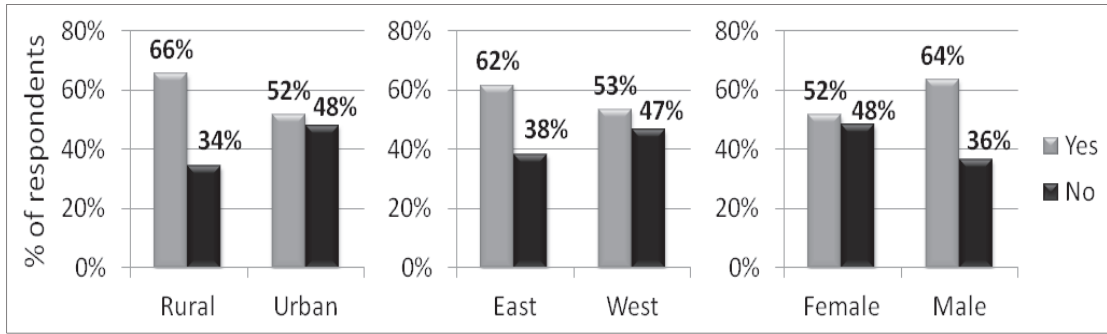


Figure 2. Awareness that environmental acts (laws) exist in Bhutan. Survey participants were asked whether or not they were aware that environmental acts existed in Bhutan. The responses were segregated by sector as indicated.

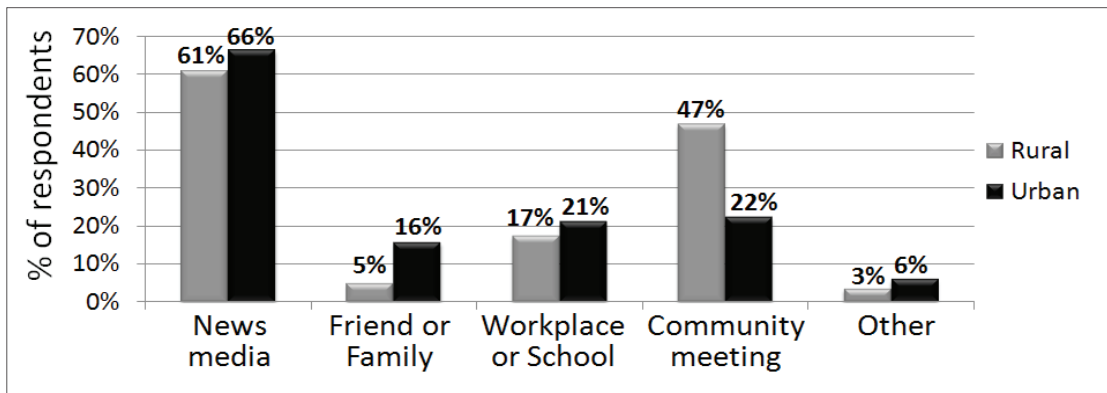


Figure 3. Sources of awareness about environmental acts. Survey participants were asked to indicate all sources they regularly received information from regarding environmental acts. Responses from Rural and Urban sectors were segregated as indicated. Bars represent the percent of respondents, from either sector, that had regularly received information from the indicated sources.

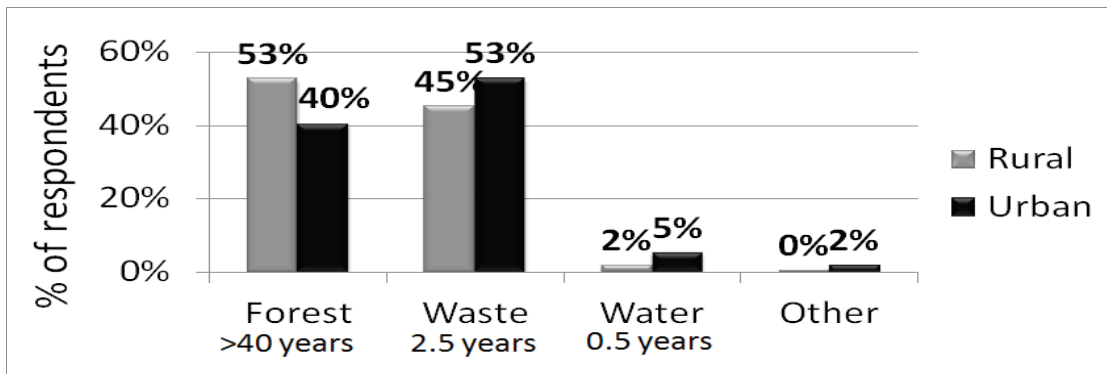


Figure 4. Awareness of different environmental acts. If survey participants indicated they did know environmental acts existed in Bhutan, they were asked to name one. The responses were categorized according to which Act they most clearly represented. The number of years indicated below each Act represents approximately how long that Act had been in implementation at the time of the survey. Responses from Rural and Urban sectors were segregated as indicated. All four bars within either sector total to 100%.

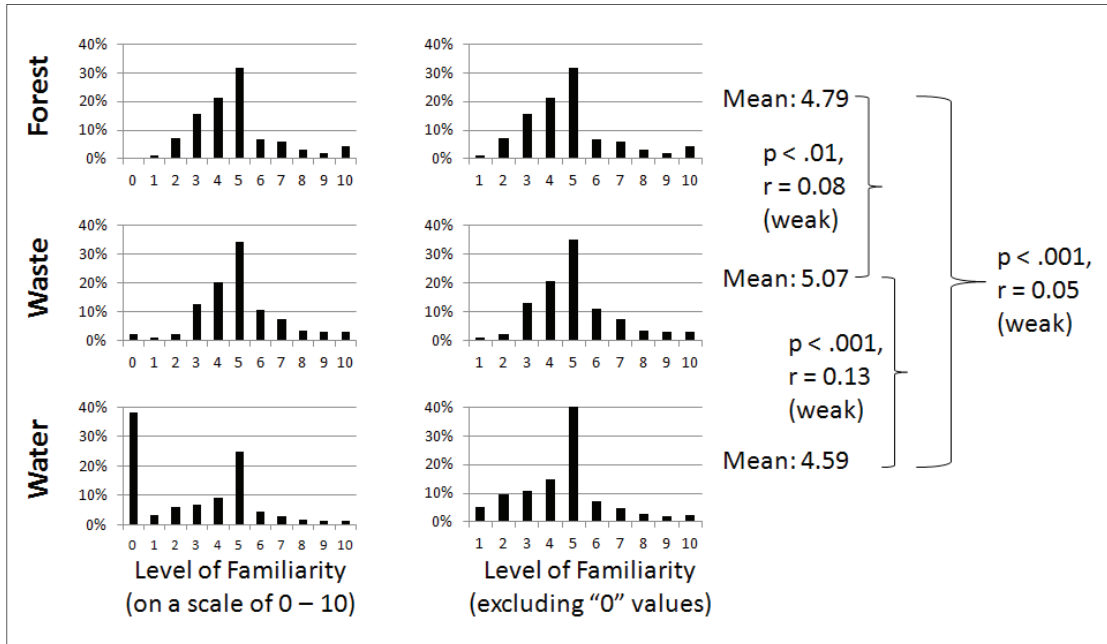


Figure 5. Level of familiarity with the Forest, Waste, and Water Acts. Survey participants who indicated they knew environmental acts existed in Bhutan were asked to rate their familiarity with each of the three Acts indicated on a scale of 0 (none) to 10 (very high). The graphs show the distribution of the responses. Because of the numerous “0” responses for the Water Act, these were excluded from the calculation of mean ratings, as shown on the graphs on the right. The p values indicate the statistical significance from paired t-test comparisons, while the r is the effect size.

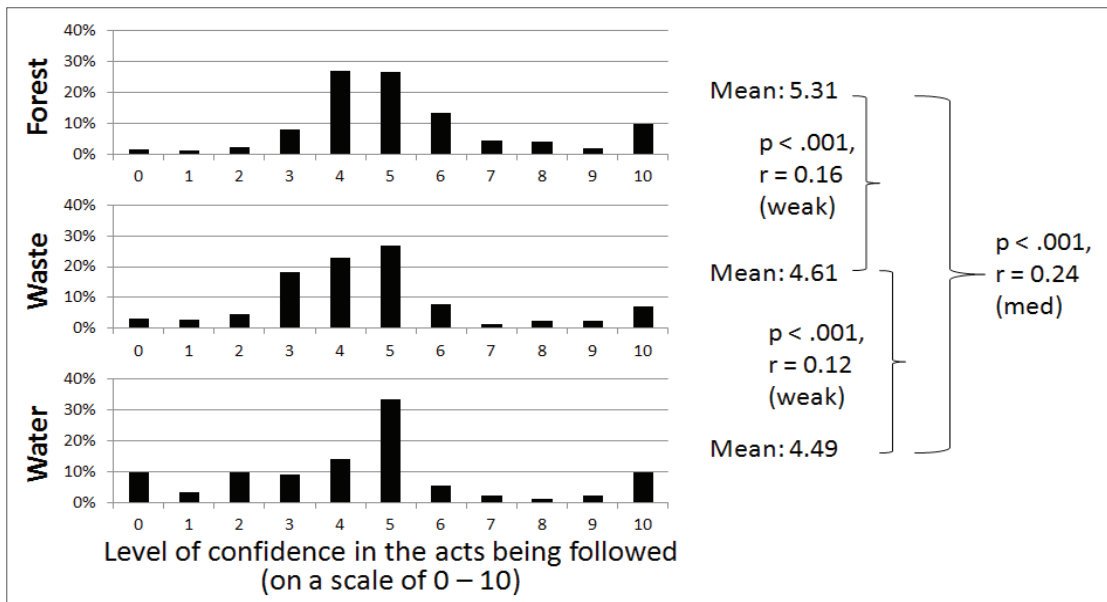


Figure 6. How well do people think the Forest, Waste, and Water Acts are being followed? Survey participants who indicated they knew environmental acts existed in Bhutan were asked to rate how well they thought each of the three indicated Acts were being followed by the citizenry, on a scale of 0 (not at all) to 10 (very well). The graphs show the distribution of the responses. Mean ratings are given on the right. The p values indicate the statistical significance from paired t-test comparisons, while the r is the effect size.

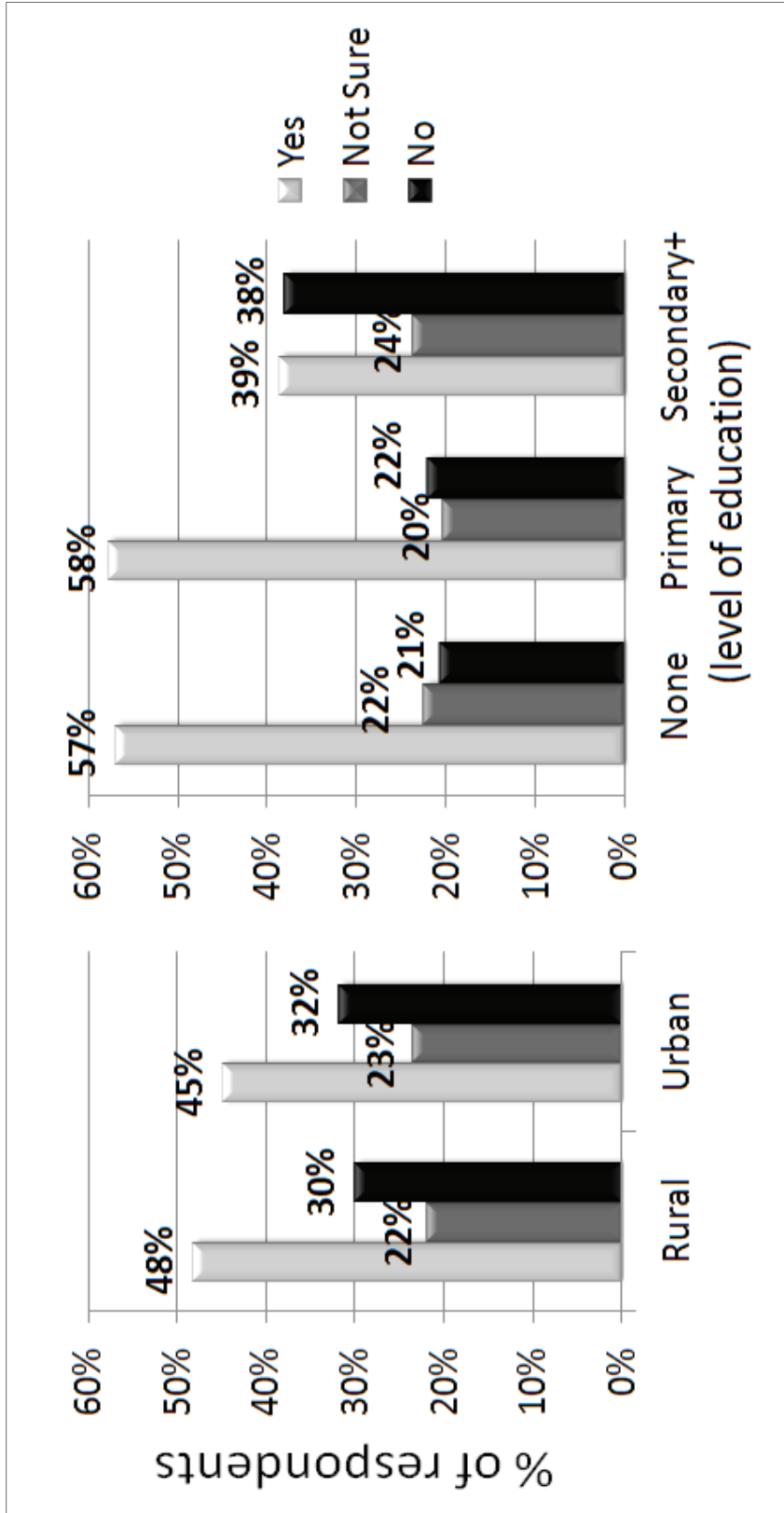


Figure 7. Do people believe that enough is being done to spread awareness about environmental acts? All survey participants were asked whether they thought enough was being done to spread awareness of environmental acts. Responses were segregated by sectors as indicated. Primary educational achievement was defined as having completed any range between formal pre-primary classes and class six, and also included non-formal education or primary monastic education. The three bars within either sector total to 100%.

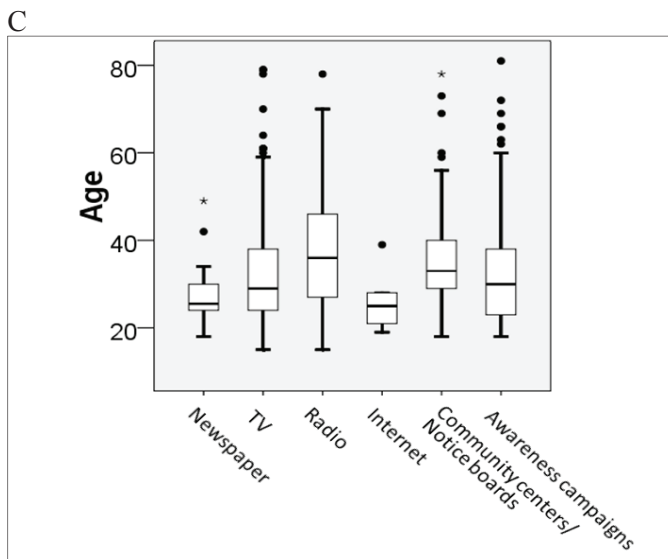
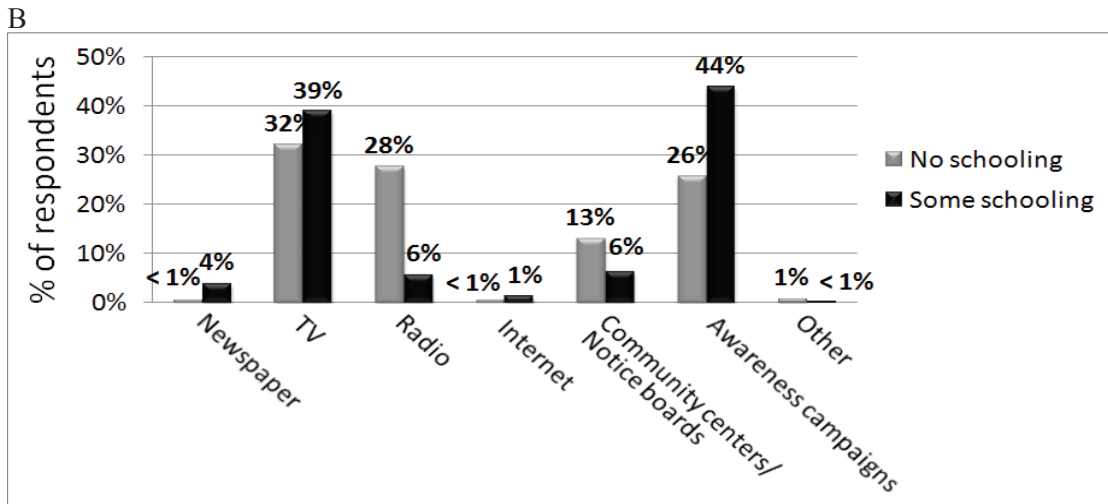
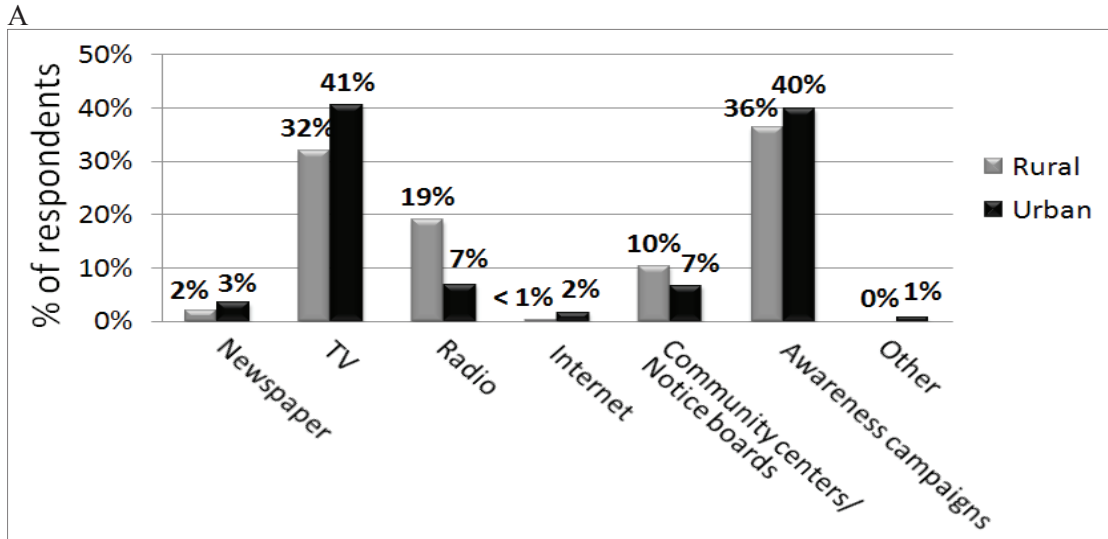


Figure 8. What modes of spreading awareness do people feel are the most effective? Survey participants were asked to indicate the one mode of communication they thought was the most effective way of better spreading awareness about environmental acts. Results were analyzed by rural vs. urban sectors (A), by whether or not respondents had any schooling (B), or by age (C). In the box-and-whiskers plot in (C), the box represents the central 50% of values, from lower to upper quartiles, with the median indicated within by a horizontal line. Outlier values that are more than 1.5x beyond the interquartile range are indicated by dots, while outlier values that are more than 3x beyond the interquartile range are indicated by asterisks.