Tensions in implementing the "energy-conservation/carbon-reduction" policy in Taiwanese culture

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HIGHLIGHTS

► Tensions occur between energy policy and traditional culture.
► Tensions occur in knowledge, life, society, and creation in Taiwan.
► The themes of the four tensions are uncertainty, pleasure, power, and control.

ARTICLE INFO

ABSTRACT

The aim of this study is to investigate the Taiwanese public's perceptions of tensions between the implementation of an energy policy and the practice of traditional culture. The energy policy calls for public actions to conserve energy and reduce carbon emissions. The research participants are 94 people, selected by balancing sexes, ages, and residential areas, from a wide range of vocations. The research data were collected by semi-structured interview with the participants individually. Interview questions were designed to elicit the participants' constructs, beliefs, behaviours, and tensions in relation to energy policy and traditional culture. Data analysis was performed based on a qualitative methodology by the procedure of open coding, theme finding, constant comparison, and theory generation. The analysis identifies four tensions: (1) tensions in knowledge bases between energy conservation and carbon reduction, (2) tensions in lifestyles between having and being, (3) tensions in social systems between authority and conformity, and (4) tensions in creation boundaries between technology and nature. The themes underlying the four tensions are uncertainty, pleasure, power, and control, respectively. Solutions to the four tensions may include practical knowledge, pragmatic idealism, hierarchical collaboration, and sustainable innovation.

1. Introduction

Anthropogenic greenhouse gas concentrations at the global scale appear to play one of the most important roles in the increase of the global average temperature (Intergovernmental Panel on Climate Change [IPCC], 2010). This phenomenon has increased the likelihood of extreme climate change and the frequency of occurrence of natural hazards in most places of the world, including Taiwan (Suen, 2010). A recent example is the typhoon on 8th August, 2009 in Taiwan that caused mudflows, landslides, and huge casualties. The frequency of occurrence of small-scale natural hazards is also increasing in Taiwan. Based on simulation, modelling, and statistical analysis of long-term meteorological, biological, human production data, etc., most

scientists predict potential impacts of climate change on Taiwan. The impacts may include (1) an increase in evapotranspiration (Yu and Wang, 2009; Yu et al., 2002), typhoon, rainfall (Cheng et al., 2009), river discharge variations (Chiang and Liu, 2013), sea level rise (Chen et al., 2012), typhoon/rainfall-triggered landslides (Chiang and Chang, 2011), the vulnerability of the water supply system (Liu et al., 2009), the epidemic of dengue fever (Wu et al., 2009), and the number of death due to cardiovascular diseases (Liao et al., 2010); (2) decrease in renewable water resource (Tsai and Huang, 2012) and total trout population (Tseng and Chen, 2008); and (3) a slight GDP loss if implementing carbon taxation and emission trading (Lee et al., 2008). Some scientists, on the other hand, predict few impacts of climate change on Taiwan in the aspect of precipitation changes (Hsu and Chen, 2002), tree plant forms (Guan et al., 2003), and crop yields (Chang, 2002).

The use of technology alone is not enough to reverse this negative trend partly because the development of green technology needs time. Social change in people's lifestyles in the reduction of energy use, on the

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other hand, appears to be a more reasonable and economical way, but it may raise tensions between technology and culture (Moriarty and Honnery, 2008).

In order to mitigate the production of greenhouse gas, global warming, and the occurrence of natural hazards, "energy-conservation/carbon-reduction" has become one of the major policies of the government in Taiwan. The energy policy was formally introduced in the *Frameworks for Sustainable Energy Policy* (2008) (also cf. Hwang, 2011; Hwang and Chang, 2011). One of the major measures to implement the energy policy is energy education for all, as shown by the *Environmental Education Act* passed by the Taiwanese congress in 2010. Despite the policy advocated by the government and the ambition to implement the policy, tensions occur between the implementation of the energy policy and the practice of traditional culture. In this study, "traditional culture" is defined as the cognitive, emotional/psychological, behavioural, social, and material meanings constructed by individuals based on all their past experiences living in a specific society or place (Stephenson et al., 2010; Takano et al., 2009). Similar tensions, however, appear to be a phenomenon widely occurring for people from diverse cultures, as indicated by Anue (2007) in Norway, Carrico et al. (2009) in the US, and Viklund (2004) in Sweden.

The purpose of this study, therefore, is to understand the tensions in implementing the "energy-conservation/carbon-reduction" policy in Taiwan based on a cultural approach using qualitative methodology (Keirstead, 2006; West et al., 2010). Qualitative methodology excels in identifying and understanding the meanings constructed by people in human–environment interactions. Based on an in-depth understanding of the view-points of the public, we are likely to identify barriers and facilitators for the implementation of an energy policy, which are strongly advocated by experts in science, economics, and technology. The participants in this study were interviewed in the second half year of 2010, around 1.5 years after the energy policy was formally launched in 2008. This present study will provide valuable evidence as to how humans respond to a "new" policy that requires them to change their lives.

1.1. Models of energy policy in the socio-cultural context

"Energy-conservation/carbon-reduction" appeared to be a policy or behaviour advocated by different cultures in the international campaign against global warming. Theorists, however, indicated that the implementation of energy policy was not only a technical or economic issue but also a human issue (Yates and Aronson, 1983). The policy required people to carry out actions and to change behaviours that had long been embedded in their daily life and culture.

Keirstead (2006) in the UK integrated the variables researched by past studies on energy policy in four major disciplines (engineering, economics, psychology, and sociology/anthropology) and posited an agent-based integrated framework for domestic energy consumption. The external systems of governments (e.g., providing subsidies), markets (e.g., fuel prices), societies (e.g., norms, culture, and lifestyles), physical environment (e.g., temperature) and houses (e.g., household appliances) would impact on the internal household systems (e.g., socio-economic status, budgets, and purchase and use behaviours), which in turn influenced energy consumption behaviours (cf. Fig. 4 in Keirstead (2006)). He believed that the psychological and societal factors, such as people's cultural values and behavioural interactions with technologies, are the major missing variable in the previous models of domestic energy consumption, which only focused on science, technology, and economics. This interdisciplinary or integrated approach had attracted growing attention from the UK government given its broad perspectives to inform

energy policy and to provide promising solutions to the complex problems of energy saving and carbon reduction.

Weber and Perrels (2000) posited a model addressing the issue of how human factors played a role in climate change using a four-stage diagram. (1) The societal hyper-structure, which is defined as tensions between the state of the art technology (e.g., available options and physical infrastructure) and lifestyle factors (e.g., societal values and cultural climate), serves as the pre-determined factor in (2) manifest lifestyle (e.g., expenditure patterns of money and time). The manifest lifestyle, in turn, influenced (3) energy use, in which tensions again occurring between technology (e.g., equipment) and lifestyle (e.g., frequency and accuracy of use), which then created (4) environmental impacts on climate change (e.g., air pollution and biodiversity) (cf. Fig. 1 in Weber and Perrels (2000)). The model focused on the issue of explicit tensions between technology and lifestyle based on an economic perspective. The results of their simulation study for West Germany, France, and the Netherlands indicate that the used of sustainable technology and practice of reflective consumption appeared to be best solutions for reducing greenhouse gas emissions without risking economic development. Their study successfully identified a number of evolutionary outcomes based on the investigation of tensions between lifestyle and technology. However, neither the meanings underlying these tensions, nor the predetermined socio-cultural factor were investigated in their model.

The above two models suggested comprehensive frameworks for understanding the tensions in implementing energy policies in local cultural contexts. The two models also mirrored the models based on multi- or trans-disciplinary perspectives in order to address environmental issues (Faiers et al., 2007; Jackson, 2005). However, we still need more culture-specific models that can allow for more opportunity for the successful implementation of an energy policy in a specific context.

1.2. Tensions between traditional cultures and energy policies (behaviour change expectations) in diverse cultures

The intended energy policy posited by a government was not necessarily put into daily practice. As such, tensions occurred between traditional/existing cultures (e.g., cultural values, prior knowledge, and social norms) and energy policies (i.e., expectations of changes in energy-use behaviours) across diverse countries. Viklund (2004) in Sweden found a weak relationship between the attitude towards and the behaviour of electricity saving. Perceived risks, on the other hand, were a significant predictor of pro-environmental attitudes and electricity-saving behaviours. Although not focusing on any specific policy, this research result implied a gap or tension between energy attitudes and behaviours and suggested that there was a complex system leading from the formation of attitudes and the willingness to take action. Effective factors could also be identified through the observation of daily practices, which could provide useful knowledge for implementing energy policy.

Anue (2007) in Norway found that the right view did not necessarily generate right energy saving behaviour, in which culture played an important role. She observed that the saving of energy was not a concern of people because Norwegians viewed home as a heaven, project, and arena for activities. The results implied a tension between social practices and household energy-saving behaviours. In China, the misconception of the need for the use of warm water in washing machines appeared to result in the use of more energy (Lin and Iyer, 2007). The tension appeared to occur between knowledge and behaviour.

The use of technology for cost saving appeared to be an effective measure in Switzerland (Goldblatt et al., 2005) and India

(Humbad et al., 2009). Interaction among tradition, culture, technology, and policy might still be taken into account when introducing new technology into the home and work places in a culture. This might help bridge the gap between policy implementation and actual behaviour (Raven, 2004).

In the US, the major issue in energy policy was car use. The misconceptions about the time of motor vehicle idling might need to be amended (Carrico et al., 2009). Social change in lifestyle and land use needed to be initiated by the government and the US people if change was to be expected in the future (Rajan, 2006). Tensions again occur between knowledge/lifestyle and energy-use behaviours.

Human community was one of the major vehicles for implementing energy policy. However, culture specificity appeared to play a significant role in the success of a campaign for energy saving. In addition, one campaign successfully implemented in a specific community was not necessarily transferrable to another community (Heiskanen et al., 2010; Peters et al., 2010). These results indicated a need to understand the context of a specific culture in a specific community (e.g., Taiwan). Based on the understanding, effective campaigns for social changes towards energy saving would be likely to be designed, as would be done in this study, and to be implemented successfully.

1.3. The "energy-conservation/carbon-reduction" policy in Taiwan

In response to global climate change, the policy, "energy-conservation/carbon- reduction," was formally launched with the publication of the *Frameworks for Sustainable Energy Policy* by the government in Taiwan in 2008. The *Frameworks* set the objectives: To return to the emission level of 2008 during 2016–2020, and to the emission level of 2000 in 2025. (The further objective, to the world standard, 50% of the emission level of 2000, in 2050, is not presented in the present *Frameworks* obtained in May 2012, but is presented in its earlier version (Hwang and Chang, 2011; Liou, 2011)).

The *Frameworks for Sustainable Energy Policy* also articulate to aim to develop four greenhouse gas reduction laws, including the Energy Management Act (Amendment) and the Renewable Energy Development, implemented from 2011, and the two other laws, the Energy Tax Act and the Greenhouse Gas Reduction Act, still under legislative review to date. Detailed comparison between the four laws can be found in Liou (2011). In addition to the above four laws, some other laws highly related to the "energy-conservation/carbon-reduction" policy can also be retrieved from the Laws and Regulations Database of the Republic of China (LRDROC) websites in Chinese or English, as presented in Table 1.

A closer look at these regulations reveals that, at the present development, three strands of related measures are to be undertaken to achieve a "low carbon society" in Taiwan. The first strand focuses on action by the government to influence the actions of all government-funded institutions by the use of decrees and punishments. The electricity and oil use of all government-funded

institutions has to maintain a negative growth rate each year. Staff, teachers, and students of such institutions have to attend environmental education for at least four hours per year, according to the *Environmental Education Act* passed in 2010. These institutions will be fined if these orders are violated.

The second strand focuses on the private companies with the use of subsidies and slight penalties when they violate management regulations. Subsidies are used to support the development of renewable energy industries, according to the Renewable Energy Development Act. Penalties are provided if companies import, export, and produce energy products without the permission from the government (the Energy Management Act), lack air pollution control equipment, burn substances harmful to health (Air Pollution Control Act), and fail to reuse or recycle items specified by the government (the Resource Recycling Act).

The third strand focuses on the general public with the use of campaigns and incentives. Related campaigns, e.g., "green hotel competition," "I love green-label products," and "sign energy-conservation/carbon-reduction declarations" are carried out to educate and encourage the general public and private industries to use and create green products. Most of the campaigns in Taiwan are organized by the Environmental Protection Administration (www.epa.gov.tw), an agency under the Executive Yuan, the highest administrative organ of the government (www.ey.gov.tw). Academics also receive funds from the government to conduct research on green products and energy education. For example, this present study is itself one of the projects on energy education and is funded by the National Science Council in Taiwan.

The *Frameworks* have set high objectives, but the measures to achieve the aim appear to be weak: Punish the public sector, manage the private sector, and educate the public. No wonder Liu et al. (2009) indicate that the far-reaching objectives are unlikely to be fulfilled. They suggest that a strategy aimed at the meeting of concrete targets may be more effective in addressing the issue of reducing carbon emissions in Taipei City, Taiwan.

The above review of the literature suggests that there will be potential tensions in a society during the implementation of any energy policy, even though it may be highly supported by the government. This study, therefore, aims to answer the following two research questions.

(1) What are the tensions in implementing the "energy-conservation/carbon- reduction" policy after the *Frameworks for Sustainable Energy Policy* of 2008 in Taiwan?
(2) What are the likely solutions to the tensions in implementing the "energy-conservation/carbon-reduction" policy after the *Frameworks for Sustainable Energy Policy* of 2008 in Taiwan?

2. Method

2.1. Participants

The research participants were 94 people living in Taiwan. They were selected by balancing sexes (48 females), residential areas, and

Table 1
Laws and regulations in relation to the "energy-conservation/carbon-reduction" policy after the implementation of the *Frameworks for Sustainable Energy Policy* in Taiwan.

Year	Laws and regulations	Source references
2009	Energy Management Act (Amendments) Renewable Energy Development Act	LRDROC (Chinese); Hwang and Chang (2011); Liou (2011)
2009	Resource Recycling Act (Amendments)	LRDROC (English and Chinese)
2010	Environmental Education Act	LRDROC (English and Chinese)
2011	Air Pollution Control Act (Amendments)	LRDROC (English and Chinese)
Under legislative review	Greenhouse Gas Reduction Act Energy Tax Act	Hwang and Chang (2011); Liou (2011)

Note. LRDROC=Laws and Regulations Database of the Republic of China, websites http://law.moj.gov.tw/eng/ (in English) and http://law.moj.gov.tw/ (in Chinese).

ages (10 and above, who are more likely to verbally express meanings well than younger children, based on past research experiences and suggestions from primary school teachers). Qualitative studies normally used small sample sizes, e.g., two Norwegian cases in Anue (2007), 21 Swiss interviewees in Goldblatt et al. (2005), a class of 27 English students in Walshe (2008), and 181 American interviewees in Sovacool (2009). The sample size in this study can allow for the inclusion of people from a wide range of vocations, including bank clerks, builders, businesspeople, computer programmers, designers, engineers, constructors, counsellors, farmers, house-husbands/wives, media workers, medical doctors, officials, religious workers, soldiers, students, teachers, the retired, the unemployed, transportation service workers, writers, etc. A broad inclusion of people from diverse vocations, ages, and residential areas can help this study give a full picture of how people in the society response to an energy policy.

The participants were recruited by the researchers, including a senior researcher and five research assistants, who were assigned to interview a number of people from specific residential areas, sexes, ages, and vocations in Taiwan. Based on the assignment, the researchers recruited the participants by convenient sampling (Lincoln and Guba, 1985), interviewing people who were easily available or referred to. No response rates were recorded but normally the people who were approached would agree to be interviewed with the convenient sampling procedure. The interviews were conducted at places that were convenient and agreed by the researchers and participants, e.g., normally the workplaces or homes of the researchers or the participants, and sometimes restaurants, parks, schools etc.

2.2. Data collection

This study used a qualitative methodology. A limited number of guiding questions were used to obtain a small sample size of research participants' viewpoints on the specific energy policy in Taiwan. The data obtained would not be statistically or quantitatively representative of the population in Taiwan but qualitatively rich for the understanding of the meaning constructed by the respondents (West et al., 2010). The research data were collected by semi-structured interview with the research participants individually. The interviews were firstly conducted by a senior researcher in a pilot study, by which interview questions suitable for the wide range of research participants were gradually established. Then, five research assistants were trained to interview the other participants. The participants' responses were explored in depth based on their responses to the interview questions until the meanings were fully clarified. The interviews lasted around 1 h. The five interview questions are as follows.

1. What is "energy-conservation/carbon-reduction" as far as you understand? What are your concerns about this? How important is this?
2. What is "traditional culture" as far as you understand? What are your concerns about this? How important is this?
3. What are the relationships between energy-conservation/carbon-reduction and traditional culture? Are there any stories or experiences that remind you of their relationships?
4. Will energy-conservation/carbon-reduction be facilitators/barriers to traditional culture or vice versa? What are your specific experiences or examples that can further explain your opinions, e.g., in the aspects of food, purchase, house, travel, and jobs?
5. What are potentially good ways (including experiences from other countries) to implement energy-conservation/carbon-reduction?

2.3. Data analysis

The interviews were conducted in Chinese and some of the participants spontaneously used Taiwanese local languages occasionally. All of the interviews were audio-recorded and fully transcribed. The verbatim transcripts of the interviews were analyzed according to the methodologies of general qualitative data analysis (Miles and Huberman, 1994), phenomenography (Marton, 1981), and grounded theory (Charmaz, 2000; Strauss and Corbin, 1990, 1998). The procedures included open coding, theme finding, constant comparison, and theory generation. The transcripts were read, keywords were identified, and similar keywords were grouped into lower-order themes. Then, the lower-order themes were organized into higher-order themes, based on the meaning of the lower-order themes and the juxtaposition of the themes in the transcripts. Finally, all of the themes were re-structured to generate suitable "theories" to answer the research questions.

3. Results

The research participants generally had rational, cognitive, and knowledgeable responses to the implementation of energy-conservation/carbon-reduction at first glance. The seemingly rational responses, however, turned into emotional ones when tensions occurred in the aspects of knowledge base, social system, lifestyle, and cultural artefact. Fig. 1 summarizes the conceptual framework of the findings obtained by the interview procedure and qualitative data analysis.

3.1. Tension in knowledge bases between energy conservation and carbon reduction

Knowledge in the cognitive aspect. Energy conservation and a reduction in carbon emissions are placed together as an action slogan, or policy, perhaps because they are scientifically linked together: We use energy and we produce carbon, or greenhouse-gas, emissions at the same time, and such process plays an important role in global warming. Scientists, educators, or policy-makers may expect that, as the two values/valences are in the same direction, they will generate more power in terms of knowledge to justify the implementation of "energy-conservation/carbon-reduction", i.e., "energy$(+1)$+carbon $(+1)=+2$." People's cognitive rationales for energy-conservation/carbon-reduction appear to fit this expectation.

- *Energy-conservation/carbon-reduction is about saving energy and reducing carbon dioxide (emissions) because there's global warming now. If we don't carry out energy-conservation/carbon-reduction, the Earth may be destroyed and lots of animals and plants will become extinct. (Male, age 11, Grade 5 primary school student)*
- *It's impossible for energy to be unlimited. Not just energy, lots of things are… It's to protect the Earth. (Female, age 16, Grade 10 senior high school student)*

The slogan "energy-conservation/carbon-reduction" places the two concepts, "energy-conservation" and "carbon-reduction", together and people by intuition explain their understanding of the slogan as a whole altogether, as expected by the policy makers. An in-depth examination of the above two quotes, however, appears to show that people may focus more on either concept and relatively less on the other. The first quote focuses more on the rationale for the reduction of carbon emissions (i.e., global warming, and the extinction of the Earth, animals and plants), and the second quote focuses more on that for energy
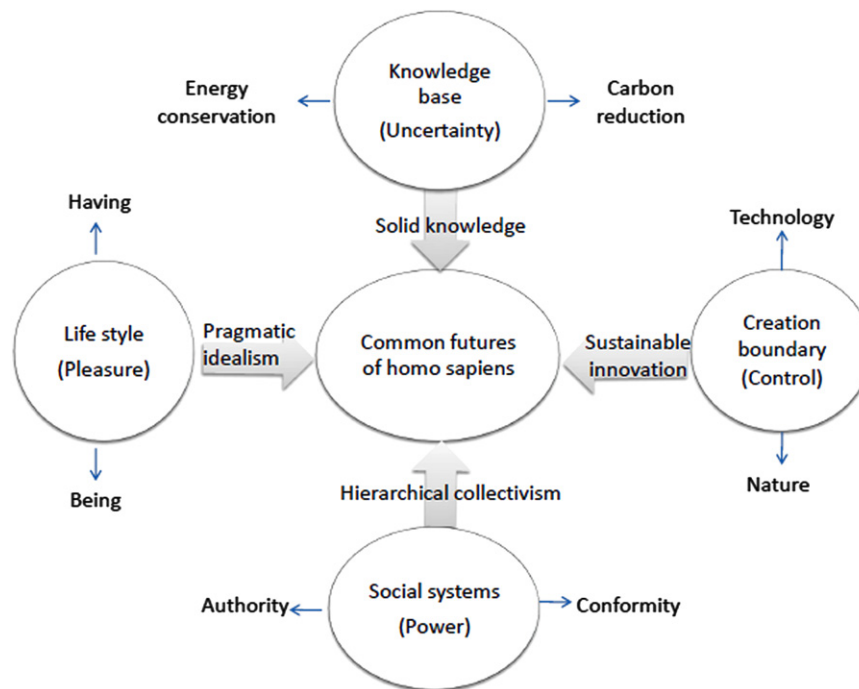
Fig. 1. Tensions in implementing an energy policy in Taiwanese culture.

conservation (i.e., limited energy resources on the Earth). In other words, people may distinctively separate, or fail to fully integrate, their rationales for energy conservation and those for the reduction of carbon emissions, which may be beyond the expectation of the policy makers who designed the slogan.

Knowledge in the emotional aspect. The knowledge in relation to energy and carbon may elicit emotional responses when "values" are conveyed implicitly. Scientists, economists, and educators have created a positive image of energy in the culture. For example, in the textbooks, students are taught that we need energy but that there are only limited resources, so we should cherish it, e.g., oil as "black gold." The experts, on the other hand, give students a negative image of carbon: People produce carbon emissions, which may destroy all the people in the world; but the question is how can we not produce carbon emissions because we are human beings as part of nature and culture. Cognitive confusion and uncertainty may explain the reasons why people doubt the need to implement energy-conservation/carbon-reduction, although it is advocated by the government.

- *Energy-conservation/carbon-reduction is important, but as for implementation, I feel it's too late in the current overall situation. Everybody may be able to do a small part, so some reduction can be made, but can you control the entire situation that the Earth is in? You can't, and it's too late anyway, like icebergs, floods, and tsunami. If icebergs melt, there will be floods…I don't know any scientific ways!… I don't have any solutions. (Female, age 50s, library manager)*
- *Taiwan is a country that depends more on foreign resources, so it sees energy conservation as a very important issue. But, where did the idea of carbon reduction come from? Did it go through thorough scientific testing? Is the testing method of 20 years ago really the same as the testing method now? Carbon is something that exists in nature, and it's very low in quantity … You will notice that many theories are shaky. (Male, age 30s, publicist in a science research and development organization)*

Knowledge in the social aspect. The policy of promoting a reduction in carbon emissions appears to be in conflict with traditional cultural practices in Taiwan in several different ways, while energy conservation appears to better fit the values, virtues, and practices advocated by its culture.

- *The government is trying to tell us not to burn the hay, isn't it distressing? … It's very inconvenient to our work… Before, we collected the hay and burnt it once it was dry so all the insect eggs will be gone, and then we didn't need to use pesticides. That's good, right? (Male, age 60s, farmer)*
- *I feel that people in the past cared more about cherishing hard work and what they had so they felt more gratitude… If we cherish hard work, we will be more frugal and diligent; we can walk instead of drive, and we can ride bikes instead of motorcycles. (Female, age 50s, chief executive officer in a religious organization)*

The actual formula may become "energy $(+1)+$carbon $(-.5)=.5$" when the cognitive, emotional, and social aspects of the knowledge are combined and put into practice in the culture. The weak knowledge base and negative image of carbon give people strong reasons not to practice energy-conservation/carbon-reduction especially when these actions obviously go against their original culture or practice. On the other hand, the knowledge in relation to energy conservation is well valued and embedded in the traditional culture of Taiwan. In addition, the emotional and social aspects of the knowledge appear to play a more significant role than its cognitive aspect. This forms the first theme: the tensions in knowledge base between energy conservation and carbon reduction.

3.2. Tensions in lifestyles between having and being

Tensions may occur in lifestyles. People may place more emphasis on having money, comfort, and pride, or place more emphasis on leading a healthy, environmental, simplistic and spiritual life.

Having money. Energy-conservation/carbon-reduction is usually not part of the agenda of the public's economic/vocational life.

- *Isn't energy-conservation/carbon-reduction promoting people to take public transportation? Then how about us who drive cabs? If everybody takes the bus, nobody will take a taxi! (Male, age 40s, taxi driver)*
- *The boss only cares about building a house fast and selling it fast…The electricity bill is around five or six hundred thousand dollars every month. … Ten or twenty thousand dollars cheaper doesn't make a big difference to me… Sometimes nobody turns off the hose all day and there's water leaking all over the ground… Nobody cares about this waste of energy. (Male, age 40s, senior engineer in construction industry)*

Having comfort or saving time. Sometimes people would like to use money (and energy) to trade for comfort or time.

- *In the rush hour, there are so many people in the mass rapid transit system in Taipei. Some people will choose to drive and sit inside their own cars even in traffic jams and then oil and money are used…. Actually, we all want to have comfort…Most people can do carbon-reduction if it is comfortable. (Female, age 17, Grade 11 senior high school student)*
- *I work in a tall building. I'll walk (up the stairs) only if there's no elevator or when I'm in a good mood. (Male, age 30s, lawyer)*

Saving face. Sometimes, we use "energy" (money) in order to establish our image of ourselves as superior to others.

- *Everybody loves driving; some people may think that driving is higher class. (Female, age 16, Grade 10 senior high school student)*
- *Elaborate worships, weddings… are a big waste, because some people just care a lot about maintaining face. (Female, age 50s, chief executive officer in a religious organization)*
- *When people pass away, our culture gives us a serious tradition. There must be a solemn ceremony with extravagance and attended by many people. (Male, age 60s, boss of a furniture shop)*

Being healthy and environmental. People acknowledge the advantages of the energy-conservation/carbon-reduction policy in promoting a better environment for living.

- *Energy-conservation/carbon-reduction is good for the overall environment for humans; at least it can reduce the problem of pollution in cities. (Male, age 30s, publicist in a science research and development organization)*
- *The oil industry fails to take care of environmental issues, only focusing on earning money…I don't want the money in compensation. I care about whether the gas emissions from their factories cause pollution. (Female, age 30s, bank clerk)*

Being simple and spiritual. The energy-conservation/carbon-reduction policy appears to fit the human pursuit of a spiritual, moral, and metaphysical life.

- *Energy-conservation/carbon-reduction can make our culture less snobbish. Everyone will go after a simpler, more frugal, and better lifestyle. (Female, age 50s, housewife)*

3.3. Tensions in social systems between authority and conformity

People are sensitive to the hierarchical system in society. There appears to be an imbalance in the relationships between the strong and the weak. The tensions in the social system between authority and conformity may occur at the cross-cultural, national, socioeconomic, religious, and group levels.

Cross-culture. People emphasize the role of the Western and developed countries in global warming.

- *For the last few centuries, there hasn't been any change in the environment of the Earth. But if it starts to change, then it should not be related to our culture and tradition. It's the change in our living habits towards westernization. (Male, age 50s, medical doctor)*
- *Even though we can take personal action, but the main source of carbon waste and energy use are big corporations. For example, America uses a lot of energy and creates lots of waste. So the major countries, like America and Europe, can serve as examples and lead the way, and us, other people, can have something to compare to and to follow. (Female, age 20s, Year-4 undergraduate student)*

Nation. People appear to assume that the government should take the most responsibility to resolve the problem of global warming at the national level.

- *All the government agencies have their air conditioning on high. I think the government should reflect on their behaviour and stop telling citizens to conserve energy and reduce carbon while they are all driving cars of more than 3000 cc. Their actions contradict their words. (Female, age 40s, English teacher in a senior high school)*
- *I think there should be another bike lane… If you force it, there may be some conflict… But Taiwanese sometimes roll with the punches… They still submit to the so-called "government." (Male, age 20s, postgraduate student in the social sciences)*

Socioeconomic status. The rich may become a focus of criticism in the movement towards energy-conservation/carbon-reduction.

- *Mansions… expensive things are about delicacy, luxury, and comfort, but regular houses care about green (things), and what saves you money… The people at the top of the pyramid (i.e., the richest) aren't affected by the others; they don't care about energy-conservation/carbon-reduction… They have so many cars. (Male, age 40s, senior engineer in the construction industry)*
- *We are promoting cremation now, but I hear that lots of government officials are still being buried. They are very superstitious about feng shui and take up a lot of land once they do it. (Female, age 50s, chief executive officer in a religious organization)*

Religion. Religion, embedded in the traditional culture, plays an important role in some people's daily lives. Religious leaders, therefore, may play a significant role in the movement towards energy-conservation/carbon-reduction.

- *You can't live if you don't use firecrackers… You tell them to conserve energy and reduce carbon emissions; tell them not to use firecrackers; that's impossible. I think it's not possible even after one hundred years… if there's a conflict, people will still side with religion. Religion is very important to Taiwanese… I feel that it wouldn't be effective if the government says it… Religious leaders may be of more help. (Female, age 40s, English teacher in a senior high school)*

Group. The dominant figures in formal (e.g., companies) or informal groups (e.g., families) appear to lead the way.

- *You do not have the power to control, depending on your status and duty. Bosses say "Turn on the air conditioner." Dare you say "no" to them? (Male, age 40s, senior engineer in the construction industry)*

- *On traditional holidays, my mother always cooks a lot…You cannot offend the elders…You have to respect them. (Female, age 30s, bank clerk)*

3.4. Tensions in creation boundaries between technology and nature

Human beings are mortal and only one part of the world, but also have the intelligence, ambition, and drive to create things and to control the whole of the world. We aim to create artefacts to give us a better life (e.g., cars) or to help us to avoid risk (e.g., measures to mitigate global warming). We may sometimes not be aware, however, of whether we are crossing the boundary of the law of nature.

Products/Technology. Some people are aware of the ambiguous impact of the use of immature green technology or goods on our environment and culture.

- *We are not quite sure whether pro-environmental goods are mature enough at their present stage of technical development or whether they can be used to substitute for their counterpart goods in an effective way. There is a gap. It's that green techniques may not be able to match green policy, rather than that green policy wants to destroy green industry. (Male, age 30s, law officer)*

On the other hand, some people are optimistic about future technologies being used to resolve the problem of energy use, to conserve energy, or to use energy effectively.

- *Lights in libraries are always on…We need to turn off the lights if there is no one there. Or, if we have motion detectors, the light will turn off automatically when there is no one there. (Male, age 11, Grade-5 student)*
- *Some famous construction companies cooperate with interior designers overseas to build green buildings, which emphasize letting sunlight indoors. This can save the use of energy. (Male, age 20s, solider)*

Design. Green designs aiming to reducing energy use and created with the use of local wisdom appear to be of innate value and intuitively acceptable.

- *The Eiffel Tower, in Paris, France, turns off half of its lights. Our Taipei 101 can also do this. (Female, age 29, computer programmer)*
- *Originality. In order to survive, you have to do something different. What are you searching for? It's to search within your traditions (origins), not from others, and then you'll make something different. (Male, age 30s, publicist in a science research and development organization)*

Nature. Some people have decided to yield to nature or to be friends with nature due to the understanding that people are deemed to lose in the fight against nature.

- *We can learn from the successful experiences of other countries. A report says that the Netherlands made land from the sea in the past but they do not do this now. They return (the land) to nature. (Male, age 30s, army officer)*
- *Water resources are the most important for organic rice, and then no phytocide, pesticides, etc. Only the water from the mountains is clean and not polluted. As such, only a very limited land can be used to really generate organic rice. (Male, age 60s, farmer)*

Creation with curiosity based on needs is part of human nature. Over-consumption becomes a reasonable development

after over-creation goes beyond our needs (Koger and Winter, 2010). Refining creations and reflecting on consumption to better fit nature appears to reverse our human nature after the experience of over-creation and over-consumption during the industrial era.

3.5. The theme underlying all the tensions and likely solutions: All for our (children's) future

At the end of knowledge discovery, it appears to be a need to go beyond all the tensions relatively explicitly emerging from the interview data, aiming to discover a common theme implicitly underlying the tensions in terms of qualitative methodology (Miles and Huberman, 1994). The theme may also help generate a framework for likely solutions. The process of theme discovery is guided by asking the questions: Why are there all these tensions? Why does it appear to be so difficult to implement an energy conservation policy at this critical moment?

The theme underlying the four sets of tensions and their likely solutions appears to be "future." All of the policies set by the government and the knowledge in relation to global warming tend to focus on a timeline and a target set in the future, as a further look at the four tensions shows:

The first tension lies in the theme of the uncertainty of the knowledge base mainly regarding carbon reduction. For example, alternative metrics are still emerging and developing to better predict the future trend of global warming (IPCC, 2009), although the past trend of long-term global temperature rises is also communicated to the public (IPCC, 2007). On the other hand, the knowledge base regarding energy conservation appears to be communicated like a "fact", e.g., limited resources on the Earth, as has long been presented in the textbook in Taiwan.

The second tension lies in the theme of pleasure. The life-style change from a *having* approach to a *being* one may hard to achieve with a warning set in the far future. For example, people may pay attention more to their current problems, e.g., avoid becoming losers in computer games or school tests, than to future problems, e.g., avoid becoming losers by 2100 in the battle against global warming (Stanton et al., 2011).

The third tension lies in the theme of hierarchical power system in the society, which occurs both in the current society/ world and even under the warning of future disaster caused by global warming. For example, the authorities (e.g., scholars, strong nations, and governments) lead people by providing scientific information, setting future objectives, and developing regulations (e.g., the *Frameworks for Sustainable Energy Policy* in Taiwan). The potential negative impacts of global warming, however, may still be most significant on the weak people in the current society and in the future (Ibarraran et al., 2009), which suggests little hope for equality and desirable social mobility.

The fourth tension lies in the theme of control, saliently exhibited by technology created by human beings to control nature, at the same time with the expectation of future disasters in relation to global warming controlled by nature. Resilience development may be a compromise between past/present technology and future nature developments (Urban and Mitchell, 2011).

The 'energy-conservation/carbon-reduction' policy is also perceived by people as a future business.

- *At my age, I don't need to worry about this problem at this stage. But I have children. Their offspring in the future will have a tougher time. They have to face the consequences…(Male, age 50s, boss of a soft drinks franchise store)*
- *My major concern is the problem of global warming. Energy-conservation/carbon-reduction can help slow down global*

warming, and help children in later generations to have a healthier environment to grow up in. (Female, age 30s, musician)

On the other hand, the theme "future" may suggest effective ways to implement the energy policy.

- *Things related to religion are very difficult to change… It may help more if there are young children at home who tell the adults… If every child says "turn off the light!" every time they leave home, you (i.e., the adults) will develop the habit…If kids are used to it when they are small, you don't need to tell them when they grow up. (Female, age 17, Grade 11 senior high school student.)*

The questions raised here include: What is the length of the timeline that government or regular people are planning for? Are we to prepare the future for our children's children? What kind of futures do we wish for our children? Policy makers, educators, and scientists who approve of energy conservation need to face the challenge of the limitation of the spectrum of public perceptions, interests, and concerns, i.e., "not at my age," which has an effect similar to that of "not in my backyard" (West et al., 2010, p. 5739). As a result, we need to develop solutions to meet both short-term and long-term interests.

4. Discussion

4.1. Likely solutions to the tensions

The present findings suggest unavoidable tensions that cannot be ignored in implementing an energy policy in an Eastern culture, Taiwan. The moves to conserve energy and bring about a reduction in carbon emissions appear to be composed of economical, effective, and nonintrusive actions to save the Earth given the limited time and tight schedule for human beings to reverse the negative trend of climate change. A survey of the relevant literature suggests likely solutions to the tensions identified in this study, as summarized in Table 2.

4.1.1. Practical knowledge

The theme underlying the tension in knowledge bases between energy conservation and reduction of carbon emissions appears to be "uncertainty." People in Taiwan accept the "facts" that (1) Taiwan heavily relies on foreign energy resources, i.e., fuel coal and oil, which produce pollution, and that (2) Taiwan's land and natural resources are limited. The knowledge regarding

global warming due to carbon emissions or the production of greenhouse gas by the use of energy, however, is "new" to the public. The uncertainty in the knowledge about carbon reduction has seriously hindered the acceptance of the energy policy by the public, especially when emotional arousal and cultural conflicts are also present.

As such, the theme of solutions to this tension is likely to be "practical knowledge," which focuses on solving energy problems in a practical way based on the known status of the existing knowledge. We may focus on "energy" for the present practice and increase the knowledge base of "carbon" by scientific inquiry. The knowledge of the need for energy conservation is relatively solid in the culture and likely short-term solutions may include broadcasting knowledge about energy and ways to save energy use, assuming responsibility, limiting energy use, and even implementing fee increases for extra energy use. On the other hand, the emerging knowledge of "carbon" suggests that there is scientific debate on reasons for and ways to mitigate global warming and climate change. The essence of scientific inquiry in relation to the issue of the reduction of carbon emissions needs to be addressed in classrooms and communicated via the mass media. Supplementary teaching materials emphasizing scientific inquiry and hands-on activities need to be provided to teachers to supplement their present teaching materials, which are normally based on the existing curriculum and out-of-date knowledge.

4.1.2. Pragmatic idealism

Lifestyles are developed over time and within a culture, and it appears difficult to change them (Anue, 2007; Lin and Iyer, 2007). The theme underlying the tension in lifestyles between having and being appears to be "pleasure." The industrial revolution and encouragement by business have driven people towards materialism (having). On the other hand, reverence for nature and morality is perceived as consistent with the implementation of an energy policy. A new future valuing "pragmatic idealism," combining materialism (the pragmatic aspect, which emphasizes well-being, health, and economy) with humanity (the ideal aspect, which emphasizes morality, meaning, and nature) may be a way to promote energy-conservation behaviours.

Theorists and studies have indicated that energy-conservation behaviours, with suitable norms, may be motivated by multiple values, e.g., biosphere, altruism, self-transcendence, and technology values (Hansla et al., 2008;Midden et al., 2007; Schwartz, 1992; Stern, 2000). Short-term solutions may focus on resolving the need for having (materialism) and include specific strategies for providing a wide range of opportunities for green jobs, increasing individual and community efficacy to implement the

Table 2
Solutions to tensions in implementing the energy policy in Taiwanese culture.

Common aim of homo sapiens: All for our (children's) futures				
Tensions	Knowledge base	Lifestyle	Social system	Creation boundary
Themes	Uncertainty	Pleasure	Power	Control
Main solutions	Practical knowledge	Pragmatic Idealism	Hierarchical collaboration	Sustainable innovation
Strong in culture	Knowledge about energy conservation	Having	Authority	Technology
Short-term solutions	1. Broadcasting knowledge	1. Green jobs	1. Moral models	1. Green technology
	2. Assuming responsibility	2. Self-efficacy	2. Action models	2. Green design
	3. Limiting energy use	3. Community-efficacy	3. Incentive system	3. Biodiversity
	4. Fee increases for extra energy use	4. Quality, not quantity	4. Evaluation system	4. Cultural diversity
Weak in culture	Knowledge for carbon reduction	Being	Conformity	Nature
Long-term solutions	1. Communicating knowledge	1. Health	1. Consensus	1. Trees
	2. Scientific inquiry	2. Happiness	2. Laws	2. Fresh air
	3. Hands-on science- education activities	3. Simplification	3. Cooperation	3. Clean natural water
		4. Spirituality	4. Collaboration	4. Naturally healthy food

energy policy, and promoting values emphasizing the quality of life, not the quantity of material objects that one has. Long-term solutions may focus on resolving the needs for "being" (humanity), which may include specific strategies highlighting health, happiness, simplification, and spirituality.

4.1.3. Hierarchical collaboration

Hierarchy in social systems appears to be a reasonable and just, but evil, design by nature and nurture. The participants in this study acknowledge the imbalance in "power" (the theme of this tension) between the strong and the weak from the cross-cultural to group levels. The strong ones appear to have to assume more responsibilities for global warming and to compensate for the environmental problems that they are held accountable for. This notion appears to be a reasonable response to the result of Samson et al. (2011) research that highly industrialized nations that contribute more greenhouse gas emissions will experience a less negative impact from climate change than nations that are not as highly industrialized, i.e., those in most of Africa, the Arabian Peninsula, Central America, Central South America, and Southeast Asia.

Individuals (including people, groups, and nations) are naturally diverse in ability and performance. The majority of people, who own and use fewer resources, admire the few individuals with a high-ability performance, who then become the leaders of the society, who have the power to own and use more resources. Finally, the general public wishes these leaders to perform as a moral model who use fewer resources. There appears to be a slim chance for a fair game in the battle against global warming.

The general public may be reluctant to conform but still have the willingness to follow the authorities. This paradox may be especially salient in a democratic country. A democratic society, like Taiwan, has a decentralized social system, which may naturally preclude the implementation of an energy policy, which is science-, future-, and change-oriented. People are not well-prepared to accept the high aims of such a policy, even though the policy appears to make sense based on scientific evidence and is consistent with traditional culture (thinking of how people lived without these present technologies/artefacts in ancient times). Many infrastructures in present society fail to fit the energy conservation policy in all physical, institutional, and mental aspects.

A democratic or decentralized social system actually may still keep a hierarchical system in people's mind, and authorities need to lead if they really believe in the scientific evidence for global warming. With all the present benefits produced by the use of technology and the reluctance to change, the public ask the authorities to lead the way to break through the possible tragedy of the "destruction of our mother Earth," and to keep their behaviour consistent with their words.

A solution to this tension may be "hierarchical collaboration," which acknowledges and utilises the hierarchical system in the society and invite collaboration among people from the whole hierarchical system. A short-term and easy solution to the tension in social system is a new environmental, moral, or ethical movement launched and modelled by the authorities. Incentive and evaluation systems need to be developed after the ethical movement. Then, consensus, laws, cooperation, and collaboration among people within nations and around the world are likely long-term solutions.

4.1.4. Sustainable innovation

The theme underlying the tension in creation boundaries between technology and nature appears to be "control." Optimism about the role of technology in mitigating global warming represents a desire to externally control nature, while reflective consumption represents a will to internally control the self from overusing natural resources (Weber and Perrels, 2000). Pessimism about the role of technology implies a cost assessment in controlling nature, while a return to nature guarantees a conservative profit in controlling the self.

The main solution to the tension in creation boundaries is likely to be "sustainable innovation," which emphasizes a compromise between the human nature to control and the will of Mother Nature. Short-term solutions to mitigate global warming may include following human nature to create and to control by developing green technology, green design, biodiversity, and cultural diversity. For example, endeavours have been invested on the creations of motorcycle engine with hydrogen-gasoline compound fuel for energy saving and carbon reduction in Taiwan (Lin et al., 2012), the predictive modelling of the trend of biodiversity or phylogenetic diversity, in Europe (Thuiller et al., 2011), and the promotion of a redesign of energy technologies and infrastructures at the societal level in the United States (Webler and Tuler, 2010).

The long-term solutions may be to reverse human nature by submitting to nature, and by allowing for more trees, fresh air, clean natural water, and naturally healthy food in our lives. The ways to achieve these long-term solutions may be environmental management for global sustainable development and environmental conservation (Udo and Jansson, 2009; Raymond and Brown, 2011), and environmental and energy education for the increase of environmental and energy literacy of student and the public (Chabalengula et al., 2012; DeWaters and Powers, 2011; Dias et al., 2004; Jan et al., 2012).

4.2. Human commonality and cultural specificity of the tensions

The use of energy is a common issue for all human beings, including both experts and the general public. This study attempts to go beyond experts' viewpoints to the public's, and we have seen how the public's perspectives mimic those of the experts. The tensions identified in this study are based on the public's perceptions of an energy policy, which appear to share a large commonality with the notions posited by scholars emphasizing an interdisciplinary approach to energy policy and sustainability development. The common notions include future; links among social, environmental, and human equity; well-being vs. well-having; and techno- vs. eco-centred (Hopwood et al., 2005; Keirstead, 2006). In addition, the meanings of the tensions are clarified and organized into a framework in this study. The framework may extend our knowledge of energy use and energy-policy implementation in diverse societies (Giddings et al., 2002).

Cultural specificity in the tensions also emerges. The culturally specific notions include the emphasis on traditional religions, saving face, hierarchical collectivism, and frugality. The majority of Taiwanese have religious belief in Confucianism, Taoism, and Buddhism, which are viewed as solutions to the dominant Western economic principles in the present Taiwanese society in terms of energy use and sustainable development (Lamberton, 2005). These tensions also reflect Hofstede's (2001) descriptions about Taiwanese as follows. Taiwanese have a medium degree of power distance from their leaders. They avoid uncertainty sometimes, trying (but not strongly) to solve the problem of uncertainty by the use of new technology, law, and religion. They also have a strong spirit of collectivism and emphasize large family systems, in which personal behaviour may be determined by elders in the large family or by the whole family. Further, Taiwanese have a long-term perspective and use a hierarchy system in ordering relationships. They are also persistent, economical, and have a sense of duty.

4.3. Limitation of this study and suggestions for future research

Qualitative methodology can delve into the world of the meanings that people construct, but may have only a weak link to the traditional quantitative fields (i.e., engineering and economics) on the issue of energy use. Future research needs to use a mixed methodology, combining both qualitative and quantitative methodologies, to fully address the complex system of interactions between people, technology, and science in the implementation of energy policy (Keirstead, 2006). Related research topics and methods may include (1) a psychological study quantifying the variables identified in this study, (2) an economics study modelling the parameters of the variables, (3) a technology study creating human-based devices to reduce energy use and carbon emissions (Chiu, 2012), and (4) an interdisciplinary study combining all of the above methods.

5. Conclusion

This study has identified four kinds of tensions in the implementation of the main energy policy in a specific culture, Taiwan, i.e., the "energy-conservation/carbon-reduction" policy after the implementation of the Frameworks for Sustainable Energy Policy (2008). The tensions identified are likely to deepen our understanding of the whole picture of the complex problem in the implementation of the energy policy, which may contribute to both the specific context of Taiwan and the world for mitigating global warming and resolving energy problems.

For the policy field, this study has initially developed four likely solutions to the four tensions, respectively, i.e., practical knowledge to tensions in knowledge bases between energy conservation and carbon reduction, pragmatic idealism to tensions in lifestyles between having and being, hierarchical collaboration to tensions in social systems between authority and conformity, and sustainable innovation to tensions in creation boundaries between technology and nature. These solutions combined suggest that an integrated approach may work in resolving the complex energy problem (Keirstead, 2006). Policy makers and educators are likely to create step-by-step and effective programs, schemes, and regulations based on the detailed descriptions of the short- and long-term solutions to the tensions in this study.

For the academic field, the identified four tensions reveal a strong multi-disciplinary nature of the issue of energy policy. In addition, the successful use of the qualitative methodology in this study shows its capability for researchers to understand the whole picture of the energy problem in a specific context. Openness to all disciplines and collaboration between diverse disciplines is especially important for the present energy problem, as all human beings are on the same boat, the common Earth, facing the same emergent big challenge, global warming.

Notes on contributor

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