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Measuring Localisation Regionally to Form a Bhutanese Index

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Abstract: Localisation may be used as a strategy to remedy the harmful socio-ecological impacts of economic globalisation, and lead to improved sustainability achievements. This article describes the formation of a regional-level localisation index for the 20 districts of Bhutan, demonstrating a way to identify localised places using regionally specific data. Secondary source data were gathered in Bhutan according to localisation expert-identified metrics, which were then weighted, standardised, scored and ranked. This enabled the formation of a Bhutanese regional-level localisation index. The index may assist those seeking regional-level localisation case studies by enabling the identification of localised places in Bhutan. The article also summarises sustainability-planning interviews carried out across Bhutan to determine causal factors relating to localisation scores, in particular focusing on the top localisation-scoring district, Dagana. The interviews revealed that Bhutan is a highly localised country that has long and intentionally planned many aspects of localisation.

Keywords: localisation; economic globalisation; urbanisation; sustainability; localisation metrics; localisation index; Bhutan

1. Introduction to Measuring Localisation

It is widely believed that the current socio-ecological crisis results in large part from the effects of economic globalisation or " ... the integration of markets into a global economy" [1] (p. 160), and the inability of sustainability to be addressed when framed within this dominant paradigm [2–9]. The widely accepted definition of sustainability is, "meeting the needs of the present without compromising the ability of future generations to meet their own needs", as part of an ongoing process of change [10] (p. 87). The need for alternative paradigms and discourses with which to address the current crisis in order to change the frame of sustainability planning so that future needs are not compromised, supports the need for research into transformation paradigms and discourses such as that of localisation [11–13].

Some describe the need for more local, regional-level socio-ecological monitoring (in this paper, regional will refer to an intra-national micro-region). For example, Duraiappah [14] emphasises the importance of scale to policymaking guidance, stating that most wellbeing changes occur locally. Graymore et al. [15] describe strategic planning and natural resource management to be focused on a regional scale that is below a state or province level, usually including two or more communities. They state that because ecological functioning and human activities "most intensely interact" at this scale, and that the regional scale is " ... where the most difference can be made by decision making and community choice", this is the level at which sustained, reflexive public participation and face-to-face communication between strategic actors can occur ([15], p. 362).

In contrast, state and national levels are described as being too socially and politically broadly based, to effectively incorporate " ... activities other than formal political action carried out by

party political actors, formally organised private industry, public sector agencies, and civil society organisations" ([16], p. 460). At this level, though "sustained face-to-face social relationships" are "influential", they usually occur between large organisations and powerful elites that are often internationally based ([16], p. 460). However some issues " ... do not have the characteristic of local resource scarcity issues typical of successful community management strategies", with problems such as climate change and international human rights being "inherently global", and requiring international cooperation [3] ([17], p. 126).

Cuthill [18] claims that regional-level social analysis is currently lacking, as this is required to compliment local environment-focused measures. Cuthill [18] recommends that these be developed to achieve significant social, economic, environmental and governance outcomes. However, global level data are still often used to explain regional level causes and effects [19]. Devuyst [20] further outlines that government and UN initiatives such as Agenda 21 call for the importance of "sustainable development" at the local level, developing the idea that this must incorporate local level sustainability assessment.

Described barriers to regional level assessments include arbitrarily defined boundaries, due to the lack of alignment between those of natural ecosystems and administration [16]. Material and human in-flows and out-flows from regions and within defined boundaries are not widely monitored [16]. Furthermore, data availability at the regional level is described as lacking [16].

Though there are negative forms of localisation that may occur due to oppressive, unreflexive or defensive governance [21–24], positive localisation is the focus of this article. Positive localisation is a sustainable, socially-just process that facilitates healthy communities, economies and environments through local governance, ownership, trade, and resource utilisation to meet essential needs within a radius of political, economic and resource dependence that is as small as practicable for any particular purpose, and that diminishes with distance [25] (in this paper, local will refer to an intra-national micro-region). Regional-level (positive) localisation measurement may then enable the holistic addressing of socio-ecological concerns at the regional or local level, providing a way to address many of the concerns outlined above.

As obtaining regional-level data is a challenge in many places, Bhutan was chosen for the development of a regional-level Bhutanese localisation index (BLI) because of the availability of the required regional data. Much of these data are used by the Bhutanese Gross National Happiness Commission (GNHC) to monitor socio-ecological concerns every five years in the form of the Gross National Happiness Index (GNHI), making Bhutan unique in its frequent and comprehensive regional socio-ecological monitoring [26]. This article describes the formation of a regional Bhutanese localisation index (BLI) comprising its 20 districts.

2. Development of the Bhutanese Localisation Index (BLI)

Data were gathered according to expert-identified localisation metrics, and used to form a BLI [25]. The index aimed to maximise assessment for sustainability by including transparent multi-criteria and sustainability assessment thresholds [25]. Incorporating localisation-expert opinion, the data were weighted and standardised to ensure that individual metrics were comparable and given appropriate representation [25].

As identified by Olivier et al. [25], and in order of perceived importance by the group as a whole determined by frequency of agreement between the experts, the metrics are:

1. Resource self-reliance;
2. Resource dependence;
3. Social health;
4. Environmental health or damage/impact;
5. Control and ownership of resources, assets and business; and
6. Localisation type: sustainable/reflexive or unsustainable/unreflexive.

The required localisation metric data were collated during a two-month research trip to Bhutan. The Gross National Happiness Commission (GNHC) assisted data collation for the BLI by providing access to all government departments and records relevant to localisation measurement. The GNHC also assisted with industry contacts for additional data.

The data were compiled using secondary sources from: Bhutanese government and government-funded publications such as the Bhutan Living Standards Survey (BLSS) [27]; the National Statistics Bureau of Bhutan (NSB); the Centre for Bhutan Studies (CBS) who provided GNHI survey data; and Otago Polytechnic who were contracted to calculate district ecological footprint (EF) results using data gathered for this project by the researcher and other available data where required (Appendix B). The gathered data, as follows, were utilised to form a regional BLI.

2.1. Resource Self-Reliance (RSR)

All of the interviewed localisation experts identified resource self-reliance as crucial to localisation measurement [25]. As suggested by the experts, resource self-reliance is represented by the following submetrics: water self-reliance %; food self-reliance %; energy self-reliance %; and housing self-reliance %. These data were sourced from secondary sources as supplied by the NSB, and determined from the BLSS [27].

2.1.1. Water Self-Reliance

There are no formal data available for water self-reliance in Bhutan. However, each Bhutanese district has ample water supply. This was determined through information provided by the GNHC, the Bhutanese Ministry of Agriculture, and other government administrators and community representatives during research trips across Bhutan. Water supply is highly localised in Bhutan, each region supplying 100% of its own water requirements.

2.1.2. Food Self-Reliance

NSB provided all food supply and consumption data for each Bhutanese district. This was available as the percentage of food consumed that is: imported; domestically produced; and home produced or gifted food. Total food consumed was also available as a total dollar value.

The recorded localisation submetric food data are the total of domestic, home and gifted produce, as a percentage of total food consumed. Due to the lack of necessary data, it is impossible to determine exactly where the domestic production had occurred. However because much of the domestic produce is consumed locally, this figure was included as local production.

2.1.3. Energy Self-Reliance

Bhutan is 100% hydro-powered. Residents consume power supplied from the hydroelectric station nearest them. Excess power is exported to neighbouring India. Fuels are mostly imported from India, and as regional fuel import data is unavailable, this was not collated.

During conversations with government officials, it was determined that there is little difference in the energy consumption patterns of Bhutanese districts. As a result it was decided that this metric is unlikely to greatly affect index rankings. The capital Thimphu was suggested the likely exception to this generalisation, as there may be higher than average fuel consumption in Thimphu due to greater vehicle ownership and industrial fuel use.

It was decided that because regional fuel consumption data are unavailable and the majority of consumed power is locally produced hydropower, all Bhutanese regions would be allocated 100% energy self-sufficiency. This limits the Bhutanese regional energy self-sufficiency figures. However this is unlikely to significantly affect BLI rankings, as the potential exception of Thimphu ranks last on the BLI anyway. The energy self-reliance submetric was included despite the lack of data availability predominantly for the purpose of demonstrating that it should be included if possible.

2.1.4. Housing Self-Reliance

Housing self-reliance data were available as the percentage of locally sourced housing materials for each district [27]. The percentage figure is used to represent the housing self-reliance for each district. This figure does not comprehensively include all house-building materials, however it does uniformly capture all locally available building materials for each district. Each district imports additional house-building materials such as metal roofing from domestic and international sources, however these figures are not available and as a result were omitted for all Bhutanese regions. Due to the similarity of house construction and need for the same construction import materials across the Bhutanese districts, this should not greatly affect housing self-reliance scores, which are given as a scaled percentage, rather than an amount.

2.2. Resource Dependence (RD)

All of the interviewed localisation experts believe that resource dependence data are important to localisation measurement [25]. The resource self-reliance figures on the BLI are a percentage figure reflecting the amount of locally produced consumption. This resource dependence figure uses the percentage of consumption that is not produced locally, and assumes that this amount is imported. This percentage then represents resource dependence, rather than being an actual measure of the amount that is imported. The percentage of consumption produced locally that was used to determine the resource dependence figure, was provided by the NSB.

2.3. Social Health (SH)

Five of the interviewed localisation experts believe that social health data are important to localisation measurement [25]. In order to gather GNHI data, the CBS regularly surveys a large, representative sample of Bhutanese residents regarding a wide range of social health issues. The CBS made available the relevant social health data. These include percentage data for each of the following submetrics: individual wellbeing (WB); a high level of trust in neighbours; and a strong sense of belonging to the local community.

2.3.1. Individual Wellbeing (WB)

Individual wellbeing data take the form of a mean subjective happiness score on a 0–10 point scale for each district. These scores were determined by the CBS, through the surveying of residents for the GNHI regarding their level of satisfaction with their health, relationships, spirituality (contentment), financial security, education and job satisfaction [28]. The highest wellbeing scored district then represents the highest score for this submetric on the BLI.

2.3.2. Trust in Neighbours

When surveying "Trust in neighbours", the CBS gathers a range of responses including "Trust none of them", "Trust a few of them", "Trust some of them", "Trust most of them", or "Don't know". The percentage score entered into the submetric "High level trust in neighbours" was the percentage for each district that reported "Trust most of them". The district with the highest percentage of residents reporting "Trust most of them" is then the top-scoring region for this submetric on the BLI.

2.3.3. Strong Sense of Belonging to the Local Community

Responses to "A sense of belonging to the local community" as collected and provided by the CBS range from "Weak", "Somewhat strong", "Very strong" or "Don't know". The percentage score entered into the submetric "Strong sense belonging to local community" is the percentage recorded for each district on the BLI. The district reporting the highest percentage of "Very strong sense belonging to local community" responses then represents the best score.

2.4. Ecological Footprint (EF)

Four of the interviewed experts believe that environmental health or impact is important to measure localisation [25]. However regional, comprehensive environmental health or impact data are not available for Bhutan. As it is believed that of the currently available environmental impact measures EF best represents the impact of humans on ecosystems [29,30], it was decided that these data would be used to represent environmental impact on the BLI.

Because regional EF data were not available for Bhutan, they were collated from relevant Bhutanese government departments during the two-month research trip in Bhutan. Otago Polytechnic was then contracted to use these and other available data where required, to calculate an EF for each Bhutanese region (Appendix B). Environmental impact for each Bhutanese region was then indicated using EF scores.

The Bhutanese EF calculations were determined using local Bhutanese hectares. Local hectare EF calculation is used to determine national as opposed to global results, in an attempt to more accurately represent actual local environmental consumption or impact, as opposed to a globalised average [19]. This local EF calculation method was chosen due to its applicability to a specific national as opposed to a global LI. Each region has then been assigned an EF score in Bhutanese hectares to represent environmental impact, the lowest score being optimal.

2.5. Control and Ownership of Resources, Assets and Business (O)

Four of the interviewed localisation experts believe that control and ownership of resources, assets and business is important to measuring localisation [25]. NSB provided all data regarding these. The two submetrics are local land ownership (%) and local business ownership (%).

NSB provided data regarding the percentage of government-owned land, and as foreign land ownership does not exist in Bhutan it is assumed that the remaining land is locally owned. Similarly, regarding business ownership, government ownership is recorded, as is foreign investment in local businesses. It was then decided that the percentage of land and businesses not owned by government or comprising foreign investment, would best represent local ownership.

The assumptions made for this metric are limited as it is possible that residents from other regions may own land or businesses within a given region. However, discussion with government representatives reported this as likely being true for a minority of cases with the exception of Thimphu. The regions with the lowest level of government ownership and foreign investment in local land and businesses then score the highest, as represented by the highest percentage of control and ownership of resources, assets and business for this submetric.

2.6. Localisation Type (LT)

Three of the interviewed experts believe that determining localisation type (LT) is important to localisation measurement [25]. Localisation type was determined using CBS data collected for the GNHI regarding participation in local governance, as represented by the percentage of residents who participate in local planning and development meetings. Participation in local governance through voting data was also available from the CBS, and could have been used to contribute to this metric. However, the voting scores for the 20 districts are very similar, with a high percentage of residents in all districts reporting that they vote, so it was decided that percentage vote would add little to regional variation in local governance participation, and these scores were then not included.

There is more variation in participation at local governance meetings. This has then been used as a percentage score to represent LT. The highest participation at local meetings represents the best LT score.

2.7. Resource Dependence Inclusion

Once the BLI was formed, it became apparent that higher levels of imports such as in Thimphu, were not being reflected. In order to overcome this problem, and in accordance with the opinions of localisation experts that resource dependence is an important measure of localisation [25], resource dependence was included as a separate metric on the BLI rather than being assumed from resource self-reliance. This metric relates to the level of imported goods and services to each district, giving an indication of the level of "unlocalisation".

Total imported goods and total imported services made up the two submetrics for the new resource dependence metric, total imports on the BLI. These provide some idea of resource dependence as suggested by many of the localisation experts, one suggesting this as being the most important localisation metric [25]. However as imports of goods and services may be unrelated to life requirements, rather representing the import of luxury items, the level of import may not reflect import dependence and may give misleading results if used for this purpose. Rather this metric was able to indicate a degree of "unlocalisation", lowering the scores of districts with high levels of imports regardless of whether these imports were providing essential goods and services or whether they were surplus to these needs.

2.8. BLI Metric Data Clarification

There are no formal data available for water self-reliance in Bhutan. However, Bhutan has abundant water and apart from the consumption of bottled drinking water (which is not significant and for which there are insufficient data at a district level), water supply in Bhutanese districts is completely local. Water use was then determined by speaking with government representatives, rather than from monitored data.

Due to the majority of energy that is consumed in Bhutan being locally produced hydropower, and also due to the lack of available regional fuel consumption data, it was decided that all Bhutanese regions be allocated 100% energy self-sufficiency for the BLI.

Due to lack of data regarding the movement of goods and services between Bhutanese districts, a resource dependence indicator for the BLI was not easily determined. However resource self-reliance figures on the BLI are a percentage figure reflecting the amount of locally produced consumption. This figure captures resource dependence to some degree, as the percentage that is not produced locally, may be assumed to have been imported. This non-locally produced percentage has then been used to represent resource dependence, rather than an actual measure of the amount that is imported. Services data were unavailable for Bhutan, so only imported goods were included on the BLI to indicate resource dependence.

The assumptions made regarding local ownership (LO) in Bhutan are limited, as district land and business ownership data are unavailable. Government and foreign land and business ownership data are available. Thus, it is assumed for the purpose of the BLI that this is the only district ownership that is not local.

Gifted food, often from rural family members to those living in urban areas, has often been included as local production though it may have been produced in a district other than where it is consumed. However, the inclusion of gifted food, and also of domestic production as local production, is consistently applied to all districts.

3. Weighting and Standardising Localisation Data, and Incorporating Assessment for Sustainability

Multi-criteria assessment (MCA) is described by Gasparatos [31] as enabling the development of flexible tools that are the most appropriate selection for assessment for sustainability. The clearly displayed multi-criteria ensure that the individual metric scores are easily identified, so that poor performance of any metric is not hidden by the composite score [31]. Transparent incorporation of individual metric thresholds may be used to signify un/sustainability.

In the development of such indexes, expert advice is often used to determine the weighting of individual metrics [31,32]. Singh et al. [33] outline that employing the opinion of experts is one of the key methods for data aggregation. However as no mention or discussion regarding localisation measurement could be identified in the literature or anywhere else, the interviewed experts were not expected to know what weighting should be assigned to each metric. Rather, the collective opinion of the experts was employed to determine the relative importance of the metrics [25].

Localisation metrics were weighted according to the number of interviewed experts identifying each metric as important [25] (Appendix A). This was achieved by dividing the number of experts that suggested a metric into 28, the total number of suggestions from all experts. For example, resource self-reliance was suggested by six out of six experts/28 total expert metric suggestions = 21% weighting. This was a way of using combined expert opinion to assign metric weightings in a situation where the individual experts could not be expected to know what the weightings should comprise. Localisation submetrics were assigned equal weighting within that metric.

As recommended by Singh et al. [33], the metric data were standardised so that they could be employed for multi-criteria, composite indexing to account for the different units measured by each metric (Appendix A). All data were scaled between 0 and 100, and converted into normalised scores to achieve standardisation. This ensured that wide-ranging scores for any particular metric would not carry extra weight. The normalised scores were then summed to obtain an overall localisation score, and ranked to form a BLI.

A traffic light sustainability system as developed for the Happy Planet Index (HPI) [34] was incorporated in the BLI. Sustainability targets highlight any metric score that signifies unsustainability, and where there is precedence for such determination these have been incorporated for the BLI. Where there is no precedence, thresholds were developed where possible as described in Olivier et al. [25].

For example, in relation to resource use, as with the HPI unsustainability is indicated in red on the BLI by EF above the fair share level, i.e., currently 4.7 Bhutanese hectares (Bha) per Bhutanese person. This specifically Bhutanese footprint calculation was determined by dividing the total productive land in that country between the population there (as described by Lenzen and Murray [19]), yielding the fair productive land share in Bhutan for the Bhutanese population. As with the HPI, where regions score less than 6.2 for social health overall, this indicates insufficient wellbeing. There was no precedence for an unsustainable governance participation score, so where there is a less than a 50% (majority) governance participation score, this is assumed undemocratic and unsustainable, while 50%–60% is assumed satisfactory and over 60% is considered good governance.

High performance is indicated only where no metrics are highlighted as unsustainable. Regions that compromise sustainability thresholds are then unsustainable, and may be seen as progressing toward localisation but not yet positively or sustainably localised. This incorporation of clearly defined thresholds where possible on the BLI, contributes to assessment for sustainability using multi-criteria assessment.

4. BLI Results and Discussion

After weighting and standardising the MCA data, a composite BLI was calculated for the 20 districts of Bhutan (Table 1). The BLI was calculated using the following formula:

$$\text{BLI} = (\text{EF scaled*X}) + (\text{RSR scaled*X}) + (\text{SH scaled*X}) + (\text{Localisation Type scaled*X}) + (\text{Local ownership scaled *X}),$$

where RSR is resource self-reliance, RD is resource dependence, SH is social health, EF is ecological footprint, O is local ownership, and X is the decimal weight of the metrics.

Table 1. Bhutanese localisation Index (BLI).

	Submetric	Resource Self-Reliance (RSR) %				RSR/100	Resource Dependence (RD)	Social Health (SH) %			SH/100	EF Bha	EF/100	Ownership (O)	Localisation Type (LT)	Score
		Water	Food	Energy	House			WB	Trust	Belong						
submetric weight		0.25	0.25	0.25	0.25			0.33	0.33	0.33						
Expert suggestions						6	6				5	4		4	3	28
decimal weight						0.215	0.215				0.18	0.14		0.14	0.11	100
Rank						/100	/100				/100		/100	/100	/100	Score
1	Dagana	100	57.6	100	81.6	84.8	15.2	59.3	58.1	70.1	61.9	1.25	74.9	98.3	81.2	69.14
2	Monggar	100	52.5	100	95.9	87.1	12.9	58	52.1	78.4	62.2	1.2	75.9	98.3	72.3	68.61
3	Trashigang	100	52.7	100	93.3	86.5	13.5	61.6	57.5	82.0	66.4	1.42	97.4	98.9	79.1	68.56
4	Samtse	100	60.4	100	82.6	85.7	14.2	60.4	56.2	85.4	66.7	1.25	0.0	95	66.9	67.98
5	Tsirang	100	56.8	100	92.9	87.4	12.6	62.1	59.1	87.3	68.8	1.63	65.6	98.9	82.1	67.78
6	Trashi Yangste	100	67	100	97.4	91.1	8.9	60.8	52.8	83.2	64.9	1.53	60.0	99	77.2	67.31
7	Sarpang	100	41	100	83.2	81.0	18.9	64.1	58.3	83.2	67.9	1.6	100.0	99.1	76.2	67.21
8	Zhemgang	100	57.3	100	95	88.1	11.9	59.1	58.4	76.1	63.9	1.45	64.1	98	70.8	66.87
9	Wangdue Pho	100	54	100	92.7	86.6	13.3	63	46.0	69.8	59.0	1.72	62.1	98.4	71.58	64.16
10	Pema Gatshel	100	39.6	100	98	84.4	15.6	56.1	50.5	78.1	60.9	1.94	67.7	98.3	81.0	63.90
11	Bumthang	100	46.9	100	97	85.9	14	62.6	39.1	69.1	56.3	1.69	79.5	98.3	71.6	63.89
12	Sandrup Jong	100	48.1	100	85.7	83.4	16.5	57.1	44.8	68.9	56.3	1.6	97.4	98.6	64.6	63.84
13	Punakha	100	52.5	100	98.2	87.7	12.3	61.6	40.0	75.7	58.5	1.83	79.5	98.6	66.8	62.78
14	Lhuentse	100	58.7	100	91.6	87.5	12.4	58.1	47.0	82.4	61.9	1.98	56.4	98.4	69.6	62.56
15	Haa	100	40.8	100	98.2	84.7	15.2	64.9	45.8	70.3	59.7	1.87	88.7	97.9	63.4	62.24
16	Tronsga	100	51.1	100	90.5	85.4	14.6	60.1	47.1	66	57.1	1.85	83.1	97.6	59.4	61.46
17	Chhuka	100	35.8	100	96.8	83.1	16.8	60.8	39.9	65.0	54.7	1.67	66.7	98.5	39.2	60.29
18	Paro	100	47.7	100	82.6	82.5	17.4	60.7	31.4	72.5	54.3	1.9	77.9	99.1	54.2	60.24
19	Gasa	100	59	100	97.6	89.1	10.8	64.4	57.5	85.8	68.5	3.15	73.3	96.5	74.5	55.43
20	Thimpu	100	39.6	100	83.9	80.8	19.1	61.7	21.4	48.5	43.4	2.05	87.2	97.6	14	52.67

Sustainability coding: green = good, yellow = needs improvement, red = unsustainable. EF fair share is 4.7 Bha p/p: <4.7 is green = good, over 4.7 is red = unsustainable, Social health: >60 = green, yellow = >50 is amber, red = <50 unsustainable. Localisation type: green >70% = good, yellow 60%–70%, red <60% unsustainable.

The results displayed in Table 1 include the localisation scores for each region in order of index rank, including all submetric scores. Dagana has the top localisation score of 69.14. Dagana performs well on all metrics, and does not compromise any sustainability thresholds.

Most of the nine lowest ranked districts show the need for sustainability improvement in relation to one or two metrics: Thimphu ranks last with a localisation score of 52.67, and is the only district determined unsustainable with regard to two metrics, social health and localisation type. Paro is the only other district to be determined unsustainable on any metric, which was localisation type.

It is of interest to note that the top six localisation-scoring regions are in less developed areas of Bhutan. As may be seen in Table 2, Dagana at rank 1, Trashigang at rank 3 and Tsirang at rank 5 all have high rural percentages and very low EF scores, and they score well on all other submetrics. The BLI then indicates that the most localised districts in Bhutan tend to be predominantly rural, and there seems to be a strong connection between increasing urbanisation and decreasing localisation in Bhutan. To further explore this and why top localisation districts achieve high scores, correlation analysis was undertaken and interviews were carried out with local government and community sustainability planners and leaders across Bhutan. Relevant points from the interviews are summarised here for discussion.

Table 2. Bhutanese district demographic statistics, Localisation Index (LI) scores and rankings.

LI Rank	Bhutanese Region	Pop.	Households	Urban %	Rural %	LI Score
1	Dagana	19,352	4474	14	86	69.14
2	Monggar	38,284	7578	20	80	68.61
3	Trashigang	16,057	10,175	12	88	68.56
4	Samtse	55,009	11,699	20	80	67.98
5	Tsirang	18,947	4120	9	91	67.78
6	Trashi Yangste	16,057	3754	15	85	67.31
7	Sarpang	34,426	7725	35	65	67.21
8	Zhemgang	19,053	3.485	19	81	66.87
9	Wangdue Phodrang	33,967	6966	31	69	64.16
10	Pema Gatshel	22,336	4681	12	88	63.90
11	Bumthang	12,707	2827	25	75	63.89
12	Sandrup Jongkhar	30,432	7198	28	72	63.84
13	Punakha	21,926	4519	21	79	62.78
14	Lhuentse	14,254	3040	9	91	62.56
15	Haa	8691	1770	17.8	82.2	62.24
16	Tronsga	13,361	2810	20	80	61.46
17	Chhuka	54,861	12,792	46.9	53.1	60.29
18	Paro	31,485	7090	11	89	60.24
19	Gasa	3049	688	14	86	55.43
20	Thimpu	89,376	20,551	87	13	52.67

Thimphu, home to Bhutan's only city and by far the most urban district in Bhutan, ranked lowest on the BLI. Three of the four most urbanised districts are in the lowest half of the rankings, including Chhuka at rank 17, (46.9% urban), Sandrup Jongkhar at rank 12 (28% urban), and Thimpu at rank 20 (87% urban). Table 2 provides this contextual demographic information, including each district's population, number of households, and the percentage of urban/rural households. However, correlations between localisation and urbanisation indicate negligible relationship ($r = -0.15489$, $n = 20$, $p < 0.054$).

Despite the lack of correlation between localisation and urbanisation in Bhutan, there were moderate to strong correlations between four of the six individual localisation metrics, and urbanisation. These were resource self-reliance ($r = -0.38$, $n = 20$, $p < 0.05$), resource dependence ($r = 0.38$, $n = 20$, $p < 0.05$), social health ($r = -0.34135$, $n = 20$, $p < 0.05$) and localisation type ($r = -0.51008$, $n = 20$, $p \leqslant 0.0411$). The lack of correlation between localisation and urbanisation in Bhutan must then be

due to the negative correlation between urbanisation, EF ($r = -0.13985$, $n = 20$, $p < 0.55649$) and local ownership ($r = -0.19549$, $n = 20$, $p < 0.05343$) in Bhutan.

Local ownership is high in all Bhutanese districts, and due to the high income earning capacity of some of the most remote areas in Bhutan as a result of the harvesting and sale of the sought after and valuable *cordycep* fungus, these remote areas have high income and consumption levels, and resulting EF scores. The correlation results with the other localisation metrics however, indicate that in Bhutan as urbanisation increases, social health, democracy and resource self-reliance decrease, and resource dependence increases. Urbanisation then does not seem conducive to localisation in Bhutan.

5. BLI Limitations

Limitations of the BLI relate mostly to data availability, principally whether regional consumption is from locally produced goods and services. Other limitations are the potentially worse localisation score for regions such as Thimphu, if more accurate and comprehensive data were available regarding local ownership, and the origins of resources consumed within each region. However, as Thimphu already ranks last on the BLI, the metric limitations described as most likely to significantly pertain to Thimphu, will not significantly affect the BLI rankings.

The food self-reliance figures are likely to be limited and even overestimated, because some produce recorded as locally produced may have been imported from other regions. Additionally the food gift category may not always comprise local production, and is generally rurally produced food such as rice that is shared with the family wherever they are. From conversations with the Bhutanese Ministry of Agriculture, GNHC and government officials during field trips, few regions are likely to import a disproportionate amount of gifted food from other regions. Thimphu is believed the likely exception, with food gifted to Thimphu residents from family all over Bhutan, and domestically produced food in Thimphu district more likely to originate from elsewhere in the country than is the case in other districts. Gifted food is a tiny portion of the food self-reliance figure however, and food self-reliance contributes only approximately 5% to the overall rankings. Food self-reliance figure limitations are then unlikely to significantly affect the BLI ranks.

Due to lack of available district fuel use data, the Bhutanese regional energy self-sufficiency figures are limited. However fuel use is a small percentage of overall energy use in Bhutan, and energy self-sufficiency contributes only approximately 5% to the overall rankings. The limitations of this submetric are then unlikely to affect BLI rankings. Again the likely exception is Thimphu, where fuel use may be higher due to greater car use and commercial activity.

LO data are limited, as it is possible that Bhutanese residents from other regions may own land or businesses within a given region. Discussion with government representatives reports this as likely being a minority of cases. Again the likely exception is Thimphu. LO is weighted 14% in the BLI, and there is little variation in the district scores for this metric. The limitations of the LO metric are then unlikely to affect the BLI ranks.

6. Causal Interviews in Bhutan

A research trip was undertaken to carry out interviews across Bhutan. The interview questions (Appendix C) were designed to seek information regarding sustainability planning in these districts, and enabled examination of whether localisation is intentionally planned. The analysis below has a particular focus on Dagana, the top localisation-scoring district.

6.1. Interview Method

Anonymous, primary qualitative data were collected across Bhutan during recorded interviews using structured and semi-structured questions, for later transcription and analysis. The interviews were carried out with 33 people involved in sustainability planning and implementation in Bhutanese government, non-government and community positions. In each district, three people or groups of people were interviewed, including at least one of each of the following: community elected

sustainability planning representative (gup); GNHC (sustainability) officer/s for the district; and the Governor (Mayor) of the district. The interviewees were predominantly sourced via GNHC staff.

As recommended by Babbie [35], voluntary participation was sought in order to minimise disruption to and intrusion on participants, by personally contacting the interviewees prior to interview. In this way if potential interviewees were unable, unwilling or uncomfortable with interview process, an alternative interviewee was sought. The interviewees were contacted via phone or email to explain the research, and to seek signed consent for interview.

The need for confidentiality, anonymity and "no harm to the participants" [35] (p. 65) was observed by ensuring that interview responses were confidential. Most interviewees were answering questions regarding how they carry out their work. Where there was the occasional need for interpretive assistance, the need for confidentiality was emphasised to the translator.

Interview responses were reviewed and excerpts most relevant to localisation planning and strategising were extracted. These were condensed into overviews of sustainability planning and practice in Bhutanese districts. Interviews from Dagana, the top localisation-scoring district, were focused upon.

6.2. Top Localisation-Scoring District Sustainability Planning—Dagana

Dagana interviewees stated a number of possible explanations for their districts' sustainability achievements. These explanations align with localisation-expert suggested characteristics or metrics [25]. The explanations and the localisation metric to which these are related, are recorded below.

Self-reliance/resource dependence

- People are content with sufficiency: One explained, "They are happy because they are self-sufficient, even though they are not rich". Another stated, "One thing is because Dagana is a rural community—there is not much development, people are much more self-sufficient. They are happy people with what they have". And from another, "Even though you are poor that does not mean you are unhappy. In fact the poorer sections are more content that the rich ones".

Social health

- Effective poverty reduction: " ... in the 10th 5-year plan, they have a poverty index about 25% or something, and by end of plan we have reduced to 4%. So we have achieved this goal ... In Bhutan overall was 15%, reduced to 7% in 10th plan". This interviewee explained that previously their district had a higher than Bhutanese district average level of poverty, and that poverty reduction in their district had resulted in a lower than average level of poverty, and a high degree of contentment.
- Low levels of inequality: People described that in Thimphu development pressure results in relative poverty, and that people experience discontent as a result. "As development increases peoples' desires and demands are increasing. That's why they feel they are not happy. ... and they have no time ... In Dagana there are not so many differences between the people and among the communities. The inequality (in Thimphu) creates the want. There is more inequality than in other areas". This interviewee believes that with development people experience "relative poverty", in contrast to people in the villages being relatively equal and experiencing a daily meal, shelter and clothing as enough for them without close reminders of people who have a lot more. Another believes that with development, inequality and relative poverty result in people attempting to obtain money through criminal means stating, "This doesn't happen much in Dagana because there is not this influence here. In Thimphu there is many influences".
- Strong sense of community: One of the interviewees described that in their district the people gather for social events, in contrast to those that are well off no longer being dependant on each other and as a result not needing to know each other. This interviewee perceives a new urban trend

toward independence as unsustainable, describing that in their district they are trying to adapt to this new pressure by encouraging social networking to preserve an interdependent culture. The interviewee described this culture as traditional, linking interdependence to a saying that, " . . . the key is in the hands of the woman, or the mother", and that what mothers do should not be decided by the father. This interviewee believes that women are more likely than men to make decisions that preserve interdependence, and that they need to be involved in decision-making.

Environmental health

- A focus on environmental protection and community forestry was described as important to sustainability success. Because the community owns and manages the forest, "they take ownership". This further protects the environment and increases sustainability.

Localisation type: governance participation

- Good leadership and effective community participation: At a grassroots level, their community makes decisions and works well together in order to decide what is most important for the community.
- Ongoing education: Local government assists the community to effectively plan sustainability themselves. This comprises assisting to the community to plan according to technical and policy guidance, and providing guidance in the form of transparent suggestions to the public in terms of the consequences of these suggestions. Local government attempts to plan in accordance with public planning expectations.

Interviewees suggested a number of recommendations for achieving localisation that are very similar to localisation expert suggested metrics [25]. The suggestions from the top-scoring region, Dagana, are summarised in Table 3. These display a great deal of localisation knowledge in this district. However as outlined in the following section relevant literature and the Bhutanese interview results indicated that there are many cultural factors that make Bhutan a relatively localised country in general.

Table 3. Comparison of localisation metrics and Bhutanese interviews.

Localisation Expert Metric Suggestions	Dagana Interviewee Suggestions for Achieving Localisation
High resource self-reliance and low resource dependence	Resource self-sufficiency in accordance with local attributes, strengths and abilities.
Social health	Importance of recognising and preserving local community traditions, beliefs, social system arrangements and needs, and the prioritisation of social health for future generations.
Environmental health/impact	Developing in a way that is suited to local environmental attributes.
Localisation type (democratic participation)	Localisation requires appropriate development for and by the people, according to local needs, beliefs, social arrangements and culture.
Control and ownership of resources, assets and business	Commonly mentioned throughout the interviews as important to achieving a feeling of community ownership.

6.3. Bhutanese Cultural Factors that Are Promoting of Localisation

Bhutan is a country that has long prioritised self-sufficiency, and it has also become a democratic country with very high levels of governance participation [36]. In rural areas, which make up 80% of the population, one person from each household is expected to participate in local governance and planning. The strongly Buddhist tradition and practice in Bhutan also works to ensure socio-ecological health [28], as this tradition promotes a prevalent attitude of contentment with sufficiency and avoiding harm to living beings [6,37,38].

Lamberton [37] and Daniels [38] describe Buddhism as fostering a tradition of being content with what you have, and being aware of the karmic concerns involved with harming other beings (past, present or future), which tends to discourage environmentally and socially harmful behaviour. Norberg-Hodge [6] explains that physical and spiritual connection to a specific place and people, is promoting of localisation. The Bhutanese Buddhist tradition, with its Bon or animist origins that emphasise spiritual connection to a specific place, might then be associated with the localisation achievements in Bhutan. Buddhism and spirituality may foster sustainability and localisation in Bhutan.

In Bhutan, rango rangdrong is a traditional concept that promotes 'standing firmly on your own two feet', which is firmly embedded in the Bhutanese psyche. There is no English literature regarding this concept, however conversations with Bhutanese people whilst carrying out this research contributed to the authors' understanding of the concept. Similar to many conceptions of localisation, rango rangdrong relates particularly to self-sufficiency and self-reliance. The Bhutanese concept of rango rangdrong might then be related to localisation in Bhutan.

It may also be observed that a process of self-reliant decentralisation consistent with this concept of rango rangdrong, and that is also promoting of localisation, began in Bhutan in the 1980s [28,39,40]. The Bhutanese interviewees described this decentralised planning process to comprise local grassroots governance participation (LT) and planning, overarched by central government plans and policies. This effectively meets community needs in compliance with national guidelines, policies ensuring governance transparency, local planning ownership, participation and control, and local knowledge inclusion.

The relatively recent commencement of road construction in Bhutan during the 1960s, and the accompanying inaccessibility of Bhutan until this time due to its being situated high in the Himalayas, has further resulted in a great degree of self-reliance and resource independence. Self-reliance and subsistence farming have then been important sustainability strategies in Bhutan for very practical reasons, though there is now the need for cash cropping to supplement this as people need some level of income to purchase what cannot be produced such as higher level education, and technological goods. Furthermore, the government has promoted cash cropping since the rupee crisis. This trade of what cannot be produced locally is consistent with localisation literature describing communities as being embedded regionally, nationally and globally, as opposed to being isolationist [6,11].

As described above, sustainability planning and implementation as carried out in Bhutan has long prioritised self-sufficiency [28], and has many similarities with expert identified localisation qualities. For example interviewees described that resource self-reliance (RSR) and decreased resource dependence (RD) is promoted with national government policies and initiatives through tax incentives and strategy provision. Strategies include community production groups and community forestry projects that are encouraged rather than enforced. Interviewees also explained that the government promotes local ownership (LO) of resources and capital by encouraging community involvement, initiative, and ownership. This encouragement comprises community forestry programs, local contracting and the formation of local groups to fulfill these contracts. Local contracting leads to the use of local as opposed to imported resources, further stimulating the local economy and employment.

Also identified during the Bhutanese interviews, social and environmental protection is traditionally a key consideration in Bhutanese planning processes, and these are commonly prioritised ahead of short-term economic gain. This aligns with a specifically Bhutanese identity and traditional subsistence, agrarian culture, as opposed to contemporary modern urban lifestyles. Protecting social health consists of preserving traditional culture, community support and vitality, through: (i) the funding of shared community projects and resources; (ii) the engagement of influential and female community members to gain community support and planning participation; and (iii) through slow, appropriate development. Environmental health is maintained through a national government policy that maintains 60% of the country's forest cover for all time, and local knowledge and community

ownership in the planning process to ensure appropriate planning and protection strategies such as local governance and community forestry.

7. Overall Discussion, Conclusions and Recommendations

According to reviewed literature and expert-recommended metrics, the higher BLI scoring districts generally have higher resource self-reliance, better social health, lower environmental impact and higher governance participation. The BLI then identifies localised places, and is representative of localisation in Bhutan. Highly localised districts score well on most metrics, interviewees in these districts describing sustainability planning that has many similarities with localisation expert-suggested qualities and metrics.

The data used for the BLI are not the perfect data with which to represent the identified localisation metrics. However, these data are the best that could be determined for this research. While the BLI formed from this data is a good indication of localisation, this can be improved with the inclusion of more accurate and comprehensive data, as some figures may be under or overestimated due to unavailable data. Due to the low weightings of the metrics relating to the unavailable data, and the relatively uniform consumption across the country in relation to these metrics, they do not significantly affect the BLI ranks. The likely exception is Thimphu, which may consume more imports and resources than has been captured. Improved data may lower Thimpu's score, however Thimphu already scores last on the BLI.

Bhutanese cultural practices such as self-sufficiency, Buddhist contentment with sufficiency and inherent localisation qualities including a lack of trade currency and remoteness until relatively recently, may contribute to localisation practices being common across Bhutan. While Bhutanese culture then appears conducive to localisation, the top localisation-scoring district Dagana places a particularly strong emphasis on localisation in its planning. Such planning is not called localisation in Bhutan, rather localisation qualities form a strong part of Dagana rural and traditional cultural practices, and of the sustainability planning process across Bhutan as administered by the GNHC.

In addition to the research described in this article, a modified version of the GNHI that incorporates environmental impact data was valuably used to compare the most sustainable places in Bhutan with the most localised [41]. This enabled quantitative determination of whether localisation is important to sustainability in Bhutan. The results indicated that in Bhutan there is a strong positive relationship between the two, adding dimension to the results presented in this paper, and adding weight to suggestions that localisation be researched as a way to improve sustainability achievements.

Availability of localisation measurement techniques and indexes enable location of the most localised places such as Dagana. These places may provide valuable localisation models, which may assist those seeking alternate ways to improve sustainability achievements. Bhutanese interviewee descriptions reveal that Bhutan is a highly localised country, and the most localised districts there may be a good place to seek localisation guidance.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A. BLI Data Sources

Metric	Data Used	Data Source
1. Resource self-reliance	Water self-reliance % Food self reliance % Energy self-reliance % Housing self-reliance %	NSB NSB NSB BLSS
2. Resource dependence	% consumption not locally produced	NSB
3. Social health	Individual wellbeing High level trust in neighbours Strong sense belonging to community	CBS CBS CBS
4. Enviro damage/impact	Ecological Footprint in Bhutanese ha	Calculated by Otago Polytechnic
5. Control and ownership resources, assets, business	% local land ownership % local business ownership	(NSB) raw data (NSB) raw data
6. Localisation type	Governance Participation local meetings	CBS

Bhutan Living Standards Survey (BLSS) National Statistics Bureau Bhutan (NSB) Centre for Bhutan Studies (CBS).

Appendix B. Bhutanese Ecological Footprints (EF) in Bhutanese Hectares (Bha)

	Food	Transport	Consumer Goods	Housing	Service	Total/Person
Bhutan	0.8981	0.1636	0.0894	0.1844	0.4840	1.8196
Bumthang	1.0616	0.0767	0.1432	0.1756	0.2283	1.6855
Chhukha	0.7755	0.4261	0.0824	0.1801	0.2026	1.6667
Dagana	0.7725	0.0462	0.0746	0.1759	0.1763	1.2456
Gasa	1.4322	0.0393	1.1939	0.1753	0.3099	3.1505
Haa	0.8917	0.0865	0.2168	0.1764	0.4953	1.8667
Lhutense	1.0724	0.0981	0.1385	0.1739	0.4953	1.9782
Monggar	0.7705	0.0217	0.0977	0.1736	0.1342	1.1978
Paro	1.1164	0.2579	0.1746	0.1776	0.1752	1.9017
Pema Gatshel	0.8912	0.0244	0.0800	0.1737	0.7668	1.9361
Punakha	0.9354	0.0669	0.1050	0.1747	0.5472	1.8293
Samdrup Jong	0.8032	0.0207	0.1038	0.1890	0.4839	1.6006
Samste	0.7841	0.0954	0.0592	0.1792	0.1295	1.2474
Sarpang	0.9048	0.0876	0.1014	0.1754	0.3348	1.6041
Thimphu	1.0981	0.4685	0.1705	0.1798	0.1340	2.0510
Trashigang	0.8811	0.0620	0.0940	0.1763	0.2046	1.4180
Trashiyanste	0.8653	0.0677	0.1182	0.1744	0.3024	1.5280
Trongsa	0.9383	0.1355	0.1104	0.1748	0.4860	1.8450
Tsirang	0.8109	0.0827	0.0784	0.1742	0.4839	1.6300
Wangdue Pho	0.9159	0.0515	0.0931	0.1780	0.4839	1.7225
Zhemgang	0.7386	0.0081	0.0517	0.1730	0.4839	1.4553

Appendix C. Bhutanese Sustainability Interview Guide

Background Information

Name of Respondent . . . . . .
Name of Institution . . . . . Region . . . . . .
Time . . . .Date . . . . . .

Introduction

Hello my name is Michelle Olivier. I am a research student from Charles Sturt University, Australia.

I am researching the relationship between sustainability and localisation. Please remember that participation in this interview is voluntary and you are free to withdraw at any time. The information that will be collected from you will be treated with care, and the results of the project can be made available to you if interested. Is it OK with you if the interview is recorded? Thank you for consenting to participate in this research. Now I would to proceed to the interview, which will take up to an hour.

1. **What do you understand the term sustainability to mean?**
    - People
    - Community
    - Governance
    - Future generations
    - Environment
    - Resource use
2. **Does your community intentionally prioritise sustainability?**
    - How do people know or learn about it?
    - Are people expected to understand it/do it/help plan for it?
3. **Is the health of the community ever/sometimes prioritised at the expense of other priorities?**
    - How are decisions made when it comes to deciding what is best for the community?
    - Are financial benefits a high priority to the community?
    - Are financial benefits sacrificed if the wellbeing gains are high enough?
    - Are wellbeing benefits sacrificed if the financial gains are high enough?
4. **Is the health of the environment prioritised at the expense of other priorities?**
    - How are decisions made when it comes to deciding what is best for the environment?
    - How are decisions made when it comes to conflicts between the community and environment?
    - Is environmental health sacrificed if the financial gains are high enough?
5. **Where are your essential needs sourced from?**
    - Water
    - Food
    - Energy
    - Clothing
    - Housing materials
6. **Are these materials intentionally sought locally? (If not go to Q12)**
    - What is the preferred source?
    - Are these preferences changing over time?
7. **If so how does the community seek to do this?**
    - Are there formal arrangements?
    - Do people have old agreements that they maintain?
    - Do individual people just choose for themselves?

- Do people trade or barter rather than pay for some local goods/services?

8. **Does the community prioritise the local sourcing of goods and materials above other priorities?**

   - For example over financial priorities?

9. **Why is the local sourcing of goods and materials important to the community?**

   - Financial benefits?
   - Social benefits?

10. **What do you understand by the term localisation?**

    - Is it important?
    - Is it a part of community planning?
    - Centralised government involvement
    - Trade with other regions
    - International trade

11. **What might be the difficulties and opportunities for other countries or communities wanting to adopt strategies to achieve localisation?**

    - For the community as a whole
    - Socially
    - Environmentally
    - Resource use
    - Economically
    - Logistically

12. **If not sourced locally how does the community decide where they will source essential goods and materials**

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