Commentary

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# Towards a Just Transition: Exploring the Role of Education and Existing Inequalities in the Untapped Potential of the Non-Formal and Informal Sector

**Abstract**

This article explores the intersection of gender and employment for a Just Transition in the Indian context. We use the concept of a "just transition" (which aims to attain carbon neutrality while not inhibiting the lives of those in the margins, economically and socially) to guide this article because it meaningfully aims to support marginalised populations in concert with greening the economy. The paper presents a macro-view of employment indicators and the rise of the informal sector which is predominantly composed of women. The paper discusses the barriers to formal employment in India as presented by feminist literature. The paper deep-dives into local voices with Mahashakti Seva Kendra, a non-profit organisation focused on upskilling and green-skilling women in Bhopal, India. Mahashakti women and students, who tend to come from marginalised sections of society, shared their insights on upskilling, decision-making both professionally and personally, how they chose to join the programme, and the psychosocial dimensions of their lives and potential livelihoods. To achieve a socially-just goal, marginalised communities deserve to be elevated in research, policy, and practice discussions with clear pathways developed for their success and inclusion. Recommendations link potentialities to move beyond informal sector jobs for a Just Transition.

**Keywords:** Just Transition, women, India, informal sector, green jobs, green-skilling

**Introduction**

Marginalised communities deserve to be elevated in research, policy, and operational discussions with clear pathways developed for their success and inclusion, while also ensuring social equity. To address this endeavour, this article homes in on the "Just Transition," which

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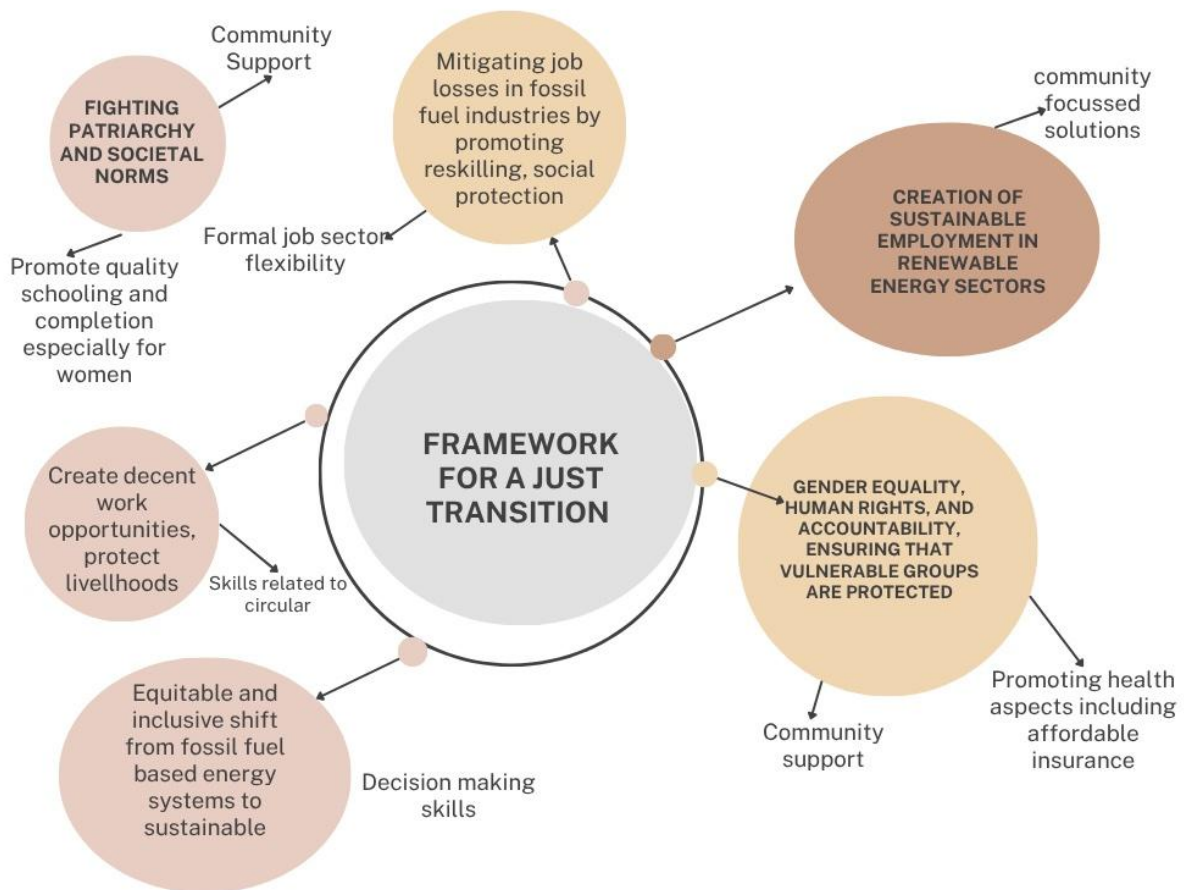
encapsulates the aforementioned noble ideals, particularly with a group of marginalised women in India. Hence, our research focuses on the factors supporting women to upskill into green jobs within a Just Transition framework (described in the two succeeding paragraphs), especially in the informal sector. We highlight this work by illuminating qualitative insights gleaned from engaging with women at a green jobs-focused non-profit organisation called Mahashakti Seva Kendra, situated in Bhopal, India. This grassroots, local flavour adds perspective by exploring their educational needs and the challenges they encounter, alongside the global picture that we present with macro-level data. We conclude with recommendations linked to the Just Transition and a green economy, recommending strategies needed to realise the transition.

**Just Transition in Brief**

The Climate Justice Alliance (n.d.) defined a Just Transition as a "vision-led, unifying and place-based set of principles, processes, and practices that build economic and political power to shift from an extractive economy to a regenerative economy". The Alliance further noted this means the production and consumption cycles need to be waste-free. They further clarify the Just Transition should address past harms and create new relationships to undo previous power hierarchies. A Just Transition requires individuals to be green-skilled to participate in an economy that adequately generates green jobs. Furthermore, McCauley and Heffron (2018) recognised the power in extending the International Labour Organization's Just Transition conceptualisation to include climate, energy, and environmental justice dimensions for a more holistic, integrated framework for understanding sustainability rooted in just practices. Figure 1 demonstrates our framework for a Just Transition: a complex web that includes the abovementioned insights and more details that are explained and expounded upon throughout this article.

**Figure 1**

Framework for a Just Transition



*Note.* Figure developed by the authors.

In the South Asian context, a Just Transition refers to the equitable and inclusive shift from fossil fuel-based energy systems to sustainable, low-carbon alternatives, ensuring that the social, economic, and environmental impacts are fairly managed for all stakeholders, especially vulnerable communities (Mohideen & Kolantharaj, 2024; . This transition aims to create decent work opportunities, protect livelihoods, and involve affected populations in decision-making processes, thereby leaving no one behind (Mohideen & Kolantharaj, 2024). The Just Transition framework is even more crucial for the Global South due to the climate justice elements it incorporates. The framework emphasises gender equality, human rights, and accountability, ensuring that vulnerable groups are protected and empowered throughout the transition process

(Mohideen & Kolantharaj, 2024). Just Transition policies focus on mitigating job losses in fossil fuel industries by promoting reskilling, social protection, and the creation of sustainable employment in renewable energy sectors (Huda, 2025). South Asian countries also require robust policy frameworks and innovative financing mechanisms, such as green bonds and renewable energy certificates, to accelerate the transition while addressing economic and social vulnerabilities (Asian Development Bank, 2023, June 13–16). Beyond decarbonisation, a Just Transition seeks to ensure energy security, resilience, and protection of ecosystems, aligning with broader sustainable development goals (Mohideen & Kolantharaj, 2024; CANSA, n.d.).

**Macro-view on Employment in South Asia and India**

To make a Just Transition, it is critical to study current employment statistics to understand employment trends. Bonnet, Leung, and Chacaltana's (2018) International Labour Office report estimated an alarming number of women (90.7%) and men (86.7%) employed in the informal sector across South Asia. Almost 96% of young people and 90% of adults were informally employed. Employment in the informal sector was 77.4%, while 6.9% were informally employed in the formal sector, and 3.5% in the household sector. Seventy-two percent in the informal sector had some tertiary education, while 84% had secondary.

In India, where Mahashakti Seva Kendra is located, Rohini Pande noted that between 1990 and 2015, the real gross domestic product per capita grew from USD 375 to USD 1,572, but the female labour force participation rate fell from 37% to 28% (2018). More recently, despite rising educational attainment and enrollment in higher education, women's workforce participation in India has declined, with rates dropping from 31% in 2013–2014 to 27% in 2015–2016, according to the International Labour Organization. This paradox is partly attributed to social norms, care responsibilities, and limited access to quality jobs (Mawii, 2019).

In 2022, only 76% of employed women belonged to the informal economy. In his article for *The Times of India*, Vikram Jain reported that there are 354 million working-age women in the country, of whom 128 million are in urban areas (2022). Of those 354 million, only 20% participate in the workforce, indicating that female labour force participation has decreased further. Among the working-aged urban Indian women, 83% come from low-income households. Among low-income household women, 85% have not attended college, and more than 50% have not completed class 10. Hence, this education gap needs to be filled. In the low-

income category, girls are dropping out of formal education systems (secondary school onwards) and most find work in the informal economy. Therefore, to increase women's participation meaningfully, low-income and low-education background women must be justly employed.

Additionally, job segregation based on women from lower socioeconomic groups is largely concentrated in the informal sector, such as agriculture, manufacturing, textiles in rural areas, and domestic work in urban settings (Kaur, 2024). The informal sector offers little to no social protection, job security, or legal safeguards. Feminist scholars argue that the disproportionate burden of unpaid domestic and care work restricts women's ability to participate in paid labour. This unpaid labour is socially unrecognised yet essential for the economy, and its unequal distribution reinforces gender inequality in employment (Mawii, 2019).

**The Occupational Segregation and Informalisation of Women**

Feminist scholarship emphasises the intersection of gender with class and caste, noting that lower-class and lower-caste women face compounded disadvantages in access to decent work, respectability, and workplace dignity (Islam, 2025). Contemporary feminist scholarship advocates intersectional approaches addressing the specific needs of women from different class, caste, and regional backgrounds. Research evidence demonstrates that lower-caste women are subjected to roles like manual scavenging (95% of manual scavengers are Dalit women) or agricultural labour, stigmatised jobs which are poorly paid (Dwivedi, 2024; Sabharwal & Sonalkar, 2015). Lower-caste women are overrepresented in informal, low-wage jobs with no social protections. For example, Dalit women constitute 16.6% of India's female population but are disproportionately excluded from stable employment due to caste-based hiring practices (Ayyar, 2017). Mainstream Indian feminism has historically centred upper-caste women's experiences, failing to address the unique struggles of Dalit women. This exclusion has led to policies that ignore caste-based violence and labour exploitation (Kumar & Bakshi, 2022).

Scholars such as Rohini Pande (2018) emphasise the paradox that while women's education levels have increased significantly, female labour force participation has stagnated or declined, particularly among moderately educated women (Fletcher, Pande, & Moore, 2017). This phenomenon is often explained by the "income effect," where women from wealthier households or with more educated spouses withdraw from the workforce, and also because

suitable employment opportunities matching their qualifications are lacking (Chatterjee, Desai, & Vanneman, 2018).

## Micro-view of Upskilling Challenges

Mahashakti Seva Kendra is a non-profit in Bhopal, providing livelihood through green-skilling, largely to 1984 Bhopal Gas Tragedy victims in the same neighbourhood as the Union Carbide Factory (Mahashakti Seva Kendra, n.d.). One of the authors, Radhika, is closely related to the non-profit, run by her mother and sister since 1994. Mahashakti provides green jobs to approximately 50 women residing in nearby re-settlement colonies or slums in Dwarka Nagar and Kainchi Chola neighbourhoods. The organisation promotes "no more chemicals" as part of the Bhopal campaign against the Carbide factory which killed thousands on December 2, 1984. Among the 8,00,000 residents of the city, it is estimated that 8,000 died instantaneously, with over 3,00,000 physically injured and 20,000 people dying in the aftermath (Sarangi, 2002, p. 47). Many Mahashakti women and their families have been physically affected.

Mahashakti's vision is to provide green employment to women, including making them professionally skilled to earn their livelihood (Mahashakti Seva Kendra, n.d.). The skills include using plastic waste to make mats, cotton scraps to make dog-beds, and deadstock cotton to make handicrafts. The women who join have no previous green-job experience and the majority are primary or secondary school graduates. The organisation also runs a computer learning (ICT) centre, teaching batches of 30 girls/women computer literacy skills, fundamental English, and principles of business and communication in a 3-month course. A particular emphasis is placed on sustainability and advocacy, with an entire unit being dedicated to environmental issues on local and global scales as well as methods to address injustice within the students' communities. The following section contains insights from interviews with the two classes enrolled at the ICT Centre during the summer of 2023.

## Mahashakti Interview Insights

Interviews with 12 girls and women across 2 ICT Centres suggested they are eager to learn about computers and gain digital literacy in preparation for a professional career. Within that group, most of the older women asserted they were fully satisfied by the current curriculum and had no additional educational requests. Considering many of them were not allowed to leave home before and the ICT Centre course was their first time doing so, this sentiment is unsurprising. Previously, they had not received exposure to different skills they could acquire

alongside what the ICT Centre already offered. However, the other participants, the majority of whom were younger, asked for additional education and training in English, highlighting a difference between women's experiences from different generations.

When participants were asked about decision-making, older participants (many of whom were married) shared that their husbands and fathers-in-law decided on their behalf, including decisions like attending ICT Centre courses. While this confirms a continued presence of patriarchal norms, some participants declared it was a shared decision, demonstrating progress. The shared responsibility for this choice is required because the women are devoting a sizeable amount of time to actions not producing immediate family benefit. Notably, several participants mentioned they were more prepared to argue and bargain for their own perspectives/choices within their families/communities because of the confidence instilled in them via the ICT training.

Another dimension of their lives captured by the interviews was climate change's impact on their families/communities. Many illustrated that excessive, sporadic rainfall caused them to experience a variety of diseases and infections. The dampness often led to hand and foot fungal infections, and the rainfall contaminated the pipeline leading to their house. Hence, the continued trend of more high-intensity storms, heightened illnesses, and infections.

The older participants also brought up increased food prices. According to the Ministry of Environment, Forest and Climate Change, crop failure due to climate change has worsened in India and by 2050, rice output is expected to fall by 20% and wheat output by 19.3% (2023). These women and their families are experiencing climate change effects via food supply issues, leading to the purpose and effects of the ICT Centre in bringing about a Just Transition.

While the ICT Centre's main function is to deliver education, they also provide current information regarding climate change and social issues. This extension/addition offers deeper knowledge of these complex issues that have borne fruit. Related actions/results to their education included planting trees and plants and encouraging neighbours and family to follow suit. Others mentioned encouraging community members to bring plastic waste to Mahashakti to be processed into textiles. Consequently, the ICT Centre turns students into spokespeople for pressing issues in society and promoting green education among their community.

Results among 12 questions[1] asked to Mahashakti women yielded eagerness for a better life with increased education. To support the qualitative analysis with a more structured, replicable approach, a Python-based text analysis was used. This approach allowed for a word-frequency to be extracted, thus reducing interpretive subjectivity. This computational method provided a quantifiable layer to identify recurring themes. Tables 1, 2, and 3 present the data from the first 3 questions, categorising the 5 most commonly recurring words for the respective question mentioned, whereas the data from Tables 4 through 12 in the Appendix follow suit with the subsequent questions.

The first question, "What are your aspirations in life?" resulted in 5 common words: "want" (24 times), "work" (10 times), "learn" (6 times), "become" (6 times), and "job" (5 times). The idea of wanting work or being able to learn to actualise one's capabilities were recurring ideas. Specifically, supporting one's family demonstrates a humane reasoning for a Just Transition. An overwhelming number of respondents included "learn" (38 times) in their answers to, "What do you want to learn at the ICT Center?" with a particular interest in learning English and understanding computers to take full advantage of pursuable opportunities. With such a compelling urge towards learning, this response had clear implications on the environment that the ICT Centre was able to foster for the women. Simply by partaking in such a community, the Centre's presence in the women's lives positively influenced their confidence, awareness, and motivation to pursue both personal and professional growth.

Decision-making in their households based on their jobs, learning, and other important aspects yielded "father," "parents," and "husband" (Table 3), ranging from decision-making made purely by families, to asking for permission (and typically being supported). Tackling these obstacles encompasses the meaning of a Just Transition. By adequately harnessing global education toward a greater scale impact for Mahashakti women can enable them to take

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[1] Method for obtaining data: In order to comprehensively analyse every portion of the interviews, each interview response was converted into a text file and thus analysed using a Python-based natural language processing approach. The algorithm organised the responses by question and counted word frequency using a thesaurus package to group similar terms together and streamline the output. Non-alphabetic characters and common stop words (i.e., "I," "me," "myself") were removed to enhance interpretability.

profound steps toward achieving a more independent, self-sufficient life, reflecting a meaningful livelihood rooted in a Just Transition.

**Table 1**

*Question 1*

| What are your aspirations in life? | |
| --- | --- |
| Word | Count |
| Want | 24 |
| Work | 10 |
| Learn Become | 6 |
| Job | 5 |
| Open Good | 3 |

**Table 2**

*Question 2*

| What do you want to learn at the ICT Center? | |
| --- | --- |
| Word | Count |
| Learn | 38 |
| Want | 22 |
| Us | 10 |
| Instructor | 7 |
| Taught Everything | 5 |

**Table 3**

*Question 3*

| Who makes decisions (your study, your jobs and other important aspects) for you at home- your mother, father, both, grandparents, relatives, you-yourself or anyone else? | |
|---|---|
| Word | Count |
| Make | 22 |
| Ask | 10 |
| Go | 7 |
| Husband Learn | 6 |
| Father Come | 5 |

**Interpreting the Future of Just Transition Through Mahashakti**

The Mahashakti case highlights how developing countries such as India, draw most of the employment through the informal sector. Typically, informal sector jobs do not cover benefits such as paid leave, health insurance, and other common formal sector benefits. A Just Transition beckons a critical informal sector examination, seeking avenues to making jobs economically lucrative, exploitation-free, and just. Meaningful studies on informal sector job types may create deeper understanding and hopeful integration into the formal economy, leading to greater job security. Additionally, we need to understand the incentives for women to join the informal sector. Is it due to dimensions like flexibility in hours and managing household work and families? This is the case for Mahashakti women. If so, creating formal sector flexibility may entice more women to join and more jobs to open. This argument is linked to affordable childcare services for mothers to work. Consequently, a holistic (re)view of support structures for women to join the formal economy is necessary for a Just Transition.

Free public services for the economically marginalised should be considered as part of a Just Transition. In the case of Mahashakti, participants wanted to learn digital skills to obtain an informal sector job. However, there were no cost-effective courses available. Hence, re-orienting technical and vocational training courses that are offered at cost-effective rates to be

geared towards the circular economy may address the current learning gaps. A special focus on post-secondary programming to build systems thinking approaches teaching intersectionality between various global goals (health, education, infrastructure, etc.) is needed. Cross-sectoral approaches can facilitate building cross-pollinated programmes for post-secondary education to prepare the young generation for a Just Transition. Moreover, education about socially just, green jobs that generate fair employment with equal opportunity, brings together many social justice- and sustainability-centred elements.

Finally, drawing from the Mahashakti experience, women attending classes had more to share about their learning experiences with their families, which improved their confidence levels. A Just Transition requires confident, mentally prepared, and skilled professionals. Therefore, all educational programmes should include a psychosocial dimension to provide the support structures needed to thrive in a booming economy.

## References

Asian Development Bank, (2023, June 13–16). *Asia Clean Energy Forum 2023*.

Ayyar, V. (2017, December 16). Caste-gender matrix and the promise and practice of academia. *Economic & Political Weekly*, *52*(50). https://www.epw.in/engage/article/caste-gender-matrix-and-promise-and-practice-academia

Bonnet, F., Leung, V., & Chacaltana, J. (2018). *Women and men in the informal economy: A statistical brief* (3rd ed.). International Labour Office.

Climate Action Network South Asia. (n.d.). *Just Transition*. https://cansouthasia.net/our-work/just-transition/

Chatterjee, E., Desai, S., & Vanneman, R. (2018). Indian paradox: Rising education, declining women's employment. *Demographic Research*, *38*, Article 31, 855–878. https://doi.org/10.4054/DemRes.2018.38.31

Climate Justice Alliance. (n.d.). https://climatejusticealliance.org/

Dwivedi, R. (2024, June 11). Shattering boundaries: Navigating the intersections of gender, caste, and class in India's quest for women's rights and gender justice. *Jusscriptum Law*. https://www.jusscriptumlaw.com/post/shattering-boundaries-navigating-the-intersections-of-gender-caste-and-class-in-india-s-quest-for

Fletcher, E. K., Pande, R., & Moore, C. T. (2017). Women and work in India: Descriptive evidence and a review of potential policies. *HKS Faculty Research Working Paper*

*Series*, RWP18-004. https://www.hks.harvard.edu/publications/women-and-work-india-descriptive-evidence-and-review-potential-policies

Huda, M. S. (2025). Towards a Just Energy Transition in Southeast Asia, *ISEAS Perspective, 2025*(35), 1–14.

Islam, A. (2025). Becoming 'working' women: Formations of gender, class and caste in urban India. *The Sociological Review*, *73*(2), 296–305. https://doi.org/10.1177/00380261241310012 (Original work published 2025)

Jain, V. (2022, December 9). What does the working-age Indian woman want, and why? *The Times of India*. https://timesofindia.indiatimes.com/blogs/developing-contemporary india/what-does-the-working-age-indian-woman-want-and-why

Kaur, K. (2024). Rights of women laborers in the Indian legal system: A critical analysis. *Journal of International Women's Studies, 26*(3), Article 12. https://vc.bridgew.edu/jiws/vol26/iss3/12

Kumar, S. (2024, March 7). The female workforce in India: Emerging trends and insights. Observer Research Foundation. https://www.orfonline.org/expert-speak/the-female-workforce-in-india-emerging-trends-and-insights

Kumar, S. & Bakshi, E. (2022). The dominant post-constitutional Indian feminist discourse: A critique of its intersectional reading of caste and gender. *CASTE: A Global Journal on Social Exclusion, 3*(1), 49–68. https://doi.org/10.26812/caste.v3i1.364

Mahashakti Seva Kendra (n.d.) Mahashakti Seva Kendra. https://www.mahashakti.org/

Mawii, Z. (2019). *Feminist perspectives on the future of work in India*. Friedrich-Ebert-Stiftung. https://library.fes.de/pdf-files/bueros/indien/15719.pdf

McCauley, D. & Heffron, R. (2018). Just transition: Integrating climate, energy and environmental justice. *Energy Policy*, *119*, 1–7. https://doi.org/10.1016/j.enpol.2018.04.014

Mohideen, R., & Kolantharaj, J. (2024). Managing gender-inclusive, just energy transitions in South Asia. *Oxford Open Energy, 3*, oiae006.

Ministry of Environment, Forest and Climate Change. (2023, December 4). *Ill-effects of climate change*. https://pib.gov.in/PressReleasePage.aspx?PRID=1982304#

Pande, R. (2018, March 10). Getting India's women into the workforce: A smart approach. *Economic Growth Center, Yale University*. https://egc.yale.edu/news/180310/getting-indias-women-workforce-smart-approach

Sabharwal, N. S. & Sonalkar, W. (2015). Dalit women in India: At the crossroads of gender, class, and caste. *Global Justice: Theory Practice Rhetoric, 8*(1), 48–73. https://www.theglobaljusticenetwork.org/index.php/gjn/article/view/54

Sarangi, S. (2002). Crimes of Bhopal and the global campaign for justice. *Social Justice*, *29*(3(89)), 47–52. https://www.jstor.org/stable/29768135

**Appendix**

**Table 4**

*Question 4*

| How do you think coming to the ICT Center will help you achieve your life's goal? | |
| --- | --- |
| Word | Count |
| Need Learn | 10 |
| Work | 9 |
| Able Job Lot Know Use | 5 |
| Communication Computer | 4 |
| People Also Example Help Tell | 3 |

**Table 5**

*Question 5*

| What will be your next step after you finish your ICT Center course? | |
| --- | --- |
| Word | Count |
| Learn | 7 |
| Continue Job Go | 4 |
| Open Home Grade | 3 |
| Want<br>Finish<br>Right<br>Exam<br>College<br>Need | |

**Table 6**

*Question 6*

| How do you think climate changes like too much rain and or too little, or too much heat disturbs your daily life and maybe your future? | |
| --- | --- |
| Word | Count |
| Lot | 15 |
| Heat | 14 |
| Rain | 9 |
| Sick | 7 |
| Good<br>Work | 6 |

**Table 7**

*Question 7*

| How has your access to food and water changed throughout your life? | |
|---|---|
| Word | Count |
| Get | 29 |
| Food | 20 |
| Used | 16 |
| House | 11 |
| Water<br>Away<br>Shop | 8 |

**Table 8**

*Question 8*

| How are resources apportioned amongst the people in your household? | |
|---|---|
| Word | Count |
| Water | 13 |
| Food | 12 |
| Eat | 11 |
| Everybody<br>Equally | 7 |
| Sometimes | 6 |

**Table 9**

*Question 9*

| How regularly do you practice the skills that you learn? | |
|---|---|
| Word | Count |
| Practice | 23 |
| Learn | 10 |
| Go Home | 8 |
| Communication Times | 5 |
| Instructor College | 4 |

**Table 10**

*Question 10*

| What are you doing right now? Are you working or in school? | |
|---|---|
| Word | Count |
| Clothes Home | 5 |
| Go | 4 |
| School | 3 |

**Table 11**

*Question 11*

| Do you have free time? If so, what do you do in your free time? How much free time do you have? | |
|---|---|
| Word | Count |
| Time | 15 |
| Free | 14 |
| Work | 10 |
| Hour | 9 |
| Get | 7 |

**Table 12**

*Question 12*

| Do you have access to other technology outside of the ICT center (ex: phones, iPads, laptops?) If you have one, how do you use it in your free time? Do you spend a lot of time on it or a little, and if you do spend time on it, how do you use it (ex: social media, video games, music, etc.?) | |
| --- | --- |
| Word | Count |
| Phone | 29 |
| Use | 25 |
| Look | 12 |
| Watch | 9 |
| Time Computer | 7 |