auger was used to drill the soil. Polyethylene bags were used to contain the soils. Mortars was used to decrease the size of the soil and hand sieving was used to sieve soil particles. e following apparatus and instruments were used during physico-chemical analysis like moisture content, pH, electrical conductivity, exchangeable acidity (exchangeable hydrogen and aluminium), organic carbon/organic matter, phosphorus, exchangeable bases (Na &K), cation exchange capacity (CEC) and nitrogen. ese were desiccator, watch glasses, drying oven, balance, spatula, pH meter, beakers (100ml&250ml), stirrer, measuring cylinder (100ml), conduct meter, conical ask (100mL & 250mL), Whatman No.40 lter paper, volumetric ask (10mL),burette(50mL), Iron stand, clamp & bosses,rubber,boiling chips,condenser, Whatman 40 dry lter paper,Vial,UV-visible spectrophotometer, shaker,volumetric ask,pipette(10mL),WhatmanNo. 44 lter paper, Flame photometer (,Elico|Flame Photometer CL378),Kjeldahl tube,distillation ask, condenser,heat mantle and atomic absorption spectrometer (AAS).

Chemicals

In this experimental analysis, all chemicals and reagents were analytical graded. ese chemicals and reagents were $K_2Cr_2O_7$(1N), conc.H_2SO_4, conc.H_3PO_4, $FeH_8N_2O_8S_2$(0.5M), $(C_6H_5)_2NH$, distilled water, catalyst mixture of K_2SO4:$CuSO_4$.$5H_2O$: Se(100:10:1w/w ratio),NaOH(40%),H_3BO_3(2%), H_2SO_4(0.01N), mixed indicator, H_2SO_4(5N), $(NH_4)_2MoO_4$(4%), Charcoal, $K_2Sb_2(C_4H_2O_6)_2$(0.275%), L-ascorbic acid (1.75%), KH_2PO_4, 0.5MNaHCO_3, $C_2H_7NO_2$(1N), standard KCl solution, standard NaCl solutions, CH_3COOH, NH_4OH, C_2H_5OH) (60%), NH_4

the urban society. is research work re ects many aspects of open burning status, such as community's knowledge and their willingness to control solid wastes, existing coordination between community and other stakeholder to keep the quality of their environment. All of the information obtained and listed in this paper are useful for environmentalists, decision makers and other stakeholder to make our urban free of open burning of solid wastes which is very danger for Organism by direct e ect or indirect through atmosphere, soil and water.

e holding in (SD-Table-2) indicated that respondents who know the meaning of open burn was 82.5% (Ambo town), 87.4% (Holeta town) and 83.71%(Bako town) and the results obtained from the three towns were close to each other. Findings also revealed that proportion of informants who always use polymer containers like plastic bags were accounted 27.8%, 78.5% and 75.3% respectively (SD-Table-2). e proportion of respondent from Ambo town was the lowest relative to the rest which was far from the reality on the ground as information gathered by eld observation. On another hand, the percentage of households who participate on open burning of solid wastes on street/ near home was 77.32% (Ambo), 84.3.2 %(Holeta) and 78.70%(Bako). is indicate that the household in Holeta town were primarily participate on open burning of solid wastes on street/near home followed by Bako and Ambo. In other hand, the percentage of household that have awareness on solid wastes disposal was 9.8%(Ambo), 9.98%(Holeta) and 6.2%(Bako). is results shown that environmental protection agency, public health, town administrative, ministry of environment forest and climate change and other stakeholders haven't pay attention to this problem. erefore, all stakeholders should take the responsibility to notice the health impact of such practice and give education on management of solid wastes to the community. e proportion of respondent that have discuss e ect of open burning with their family or neighbor

in the study areas are participated on open burning of solid waste, such practice is not come from their will. is is happening due to absence sector who take the responsibility and give proper awareness about health hazards associated with burning solid wastes. e other point is lack of cooperation between among household to ght such practice. As the information gathered from households of all study areas, the main and most obstacles are lack of commitment of town municipal to collect solid on time, lack of regular schedule for the time of collection and weakness of rule and regulation dealing with such practice.

e household who belief that open burning of solid waste is very danger to air, soil and animals are 85.1%, 89% and 78.0% respectively whereas, who believe that such practice has no e ect on air, soil and animals were account as 5.2%, 5% and 9% respectively. ese results have strong coherence with question indicated in (Table 6). Similar factors that push people to such practice were revealed by these two question (Tables 6 and 7) such as lack of well-designed damp, educating communities, problem in solid wastes avail place on time, rule and regulation on solid waste management, weakness of municipal and other alternatives like recycling

e percentages of households who take the responsibility for controlling open burning of solid wastes are 7.5%, 13.65% and 12.6% respectively (Table 8). On other hand, the proportion of house hold who gave the responsibility to town municipal are 49.5% (Ambo),49.6% (Holeta) and 48% (Bako) followed by the proportion of household who gave the responsibility for both individual and town municipals were 23.50%,18.4% and 16.6% respectively. On other hand, the percentage of household who didn't know who is responsible are 17.5% (Ambo), 15.5 % (Holeta) and 20.8% (Bako). e result showed that, most of the household gave the responsibility for town municipal.

e rank of typical solid wastes compositions in each study area is indicated in (Table 9). e dominant solid wastes in three study areas are plastics, papers, textile, garbage like chati, onion shell, ash, ne and wood respectively. e most dominant over the other are plastics, textile and papers followed by garbage. e characteristics of solid waste in three study areas are more or less similar. Generally, when we conclude the composition of household solid waste from all the three study areas, Organic solid waste was the highest followed by plastic and paper followed by metals and rubber were found in minimal proportion relative to the others.

Physic-chemical properties of soils

Mainly change in native soil physico-chemical properties could take place due to anthropogenic action example agricultural practice and disposing wastes to the soil like open burning solid wastes. e following results indicate the study investigated the e ects of burning solid wastes on physical and chemical properties. Accordingly, all the results obtained were indicated by table and graph as observed below.

e results obtained from laboratory of physico-chemicals of both samples and reference soils from the three towns were summarized in (Table 10). e comparison of both types of soils' properties was as follow. Our predictions indicate that, most of the soil physico-chemical properties showed signi cant di erences between the reference and sample soils. e results obtained indicated that a small variation in pH values that range from 6.24±0.01 to 7.71±0.00. ese values indicate that the soil is slightly alkaline to neutral. e results of our study indicated that the reference soils had lower pH as compared to the sample soils except reference soil taken from Ambo with pH7.71±0.00. and these results may have related to some nutrients like carbonate and other organic matter. e minimum and maximum percentage of oxidizable organic carbon of soil sample were 1.95±0.05 and 2.62±0.58 while the values of reference soils were 1.02±0.06 and 3.67±0.03. e soil total organic carbon, content soil sample were shown as B_S (3.48 ±0.08)> A_S (2.66±0.07)> H_S (2.59±0.07), and the results for reference soil indicated as B_R (4.88±0.04)> H_R (2.86±0.07)> A_R (1.35±0.08) and the di erence between sample and reference soil was signi cant (Table 9). According to Erika Méndez and his co-worker, Organic matter content is one of soil properties which plays a strong role for de ning di erent chemical interactions between the organic pollutant and soil [18]. Following this, the determined organic matter content was found in the range of 2.43±0.14 to 8.68±0.06. which illustrated that the values obtained for soil samples were almost similar but for reference soil from di erent town the lowest value (2.43±0.14) and the highest is 8.68±0.06. It is known that, TOC is widely used method to determine the volume of humus and organic material in soil and then its measurements was took place to see whether soil composition is signi cantly altered or not due to burning of solid wastes. e values of total organic carbon were

reference soil from 0.07 ± 0.00 dS/m) to 0.17±0.00 dS/m) which indicate that in general sample soil has higher conductivity than reference soil. Analyzing electrical conductivity is used to estimate salt content which used to evaluate soil quality and advantageous for monitoring the e ects of open burning of solid wastes on the soil composition and related environmental impacts. e measurement of this parameter provides indication of the chemical nature of the soil. Soil phosphorus content, which reached the highest value for the soil sample from Ambo (24.05±0.31) and the lowest content was recorded for soil sample from Bako town (18.08±0.35) and for both sample and reference soil, the range of this nutrient was from 18.08±0.35 to 24.05±0.31. Exchange bases were analyzed for both Ca and Mg with recorded values from 19.03 ± 0.94 cmol/kg soil to 54.73±0.12 cmol/kg soil and 34±0.03cmol/kg soil to 6.67±0.02 cmol/kg soil respectively. Both Calcium and magnesium concentrations found in soil from the open burning areas were signi cantly higher than those corresponding to the non-burning area(reference) except reference soil from Bako town shown higher value (4.24±0.30) than sample soil (3.83±0.04) (Table 1).

Table 12: Percentage of recovery of heavy metal.

Sampl Code	Heavy metals					
	Cd	Ni	Cr	Co	Cu	Pb
A_R	99.00 ± 2.00	99.00 ± 0.00	73.55 Ñ 9.21	109.00 ± 0.00	92.50 Ñ 0.00	148.00 Ñ 27.21
A_S	82.00 Ñ 0.00	97.42 Ñ 0.00	88.12 Ñ 0.00	88.00 Ñ 0.00	89.00 Ñ 0.00	144.00 Ñ 7.12
H_R	91.00 ± 0.00	92.17 Ñ 0.00	95.50 Ñ 0.00	97.75 Ñ 0.00	85.50 Ñ 0.00	136.00 Ñ 0.00
H_S	94.00 ± 0.00	95.83 Ñ0.00	110.25 Ñ8.13	80.50 Ñ 3.52	78.75 Ñ 5.32	152.00 Ñ 38.81
B_R	85.00 Ñ 0.00	97.50 Ñ 0.00	102.77 Ñ0.00	100.35 Ñ 0.00	85.50 Ñ 0.00	152.00 Ñ 38.81
B_S	94.00 ± 0.00	95.83 Ñ 0.00	80.88 Ñ 0.00	99.00 ± 0.00	78.50 Ñ 0.00	144.00 Ñ 7.12

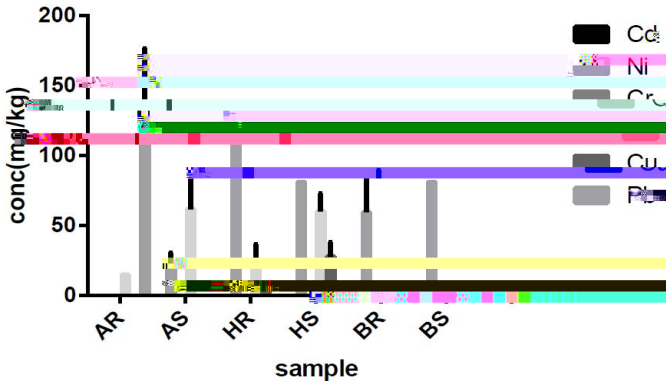

Figure 6: Variation in the concentrations of heavy metals in soil samples relative to reference soil.

(56.57), Ni (30.09) and Co (25.91) were very large, indicating that large spatial variability of these three heavy metals (Table 12, Figure 6). Figure 6 above shown that soil samples were highly contaminated with Ni followed by Co and Cu. e values of Ni and Co throughout the investigated soils except A_R indicated that high loaded of these metals which revealed the role of external sources Generally, the di erence in elemental type and concentrations in analyzed soil samples could be attributed to the di erence in the types and amount of wastes compositions (characteristics) in study areas.

Conclusion

e results obtained from community practice assessment, eld guided observation and analysis of physicochemical properties shown that poorly management of solid wastes which cause for open burning on public street, near home, communal burning area, near hospital, institution and other similar places in study areas and these results also provide a strong justi cation about the weakness of all stake holders in management of solid wastes, lack of system and regulation that used to control solid wastes. To encounter the impact of practice on human being and environment, the authors propose the following recommendations depend on results obtained from assessment, eld observation and soil physicochemical analysis.