



Background

Rural nepalese people do not have access to electricity or natural gas, and they have to rely on burning biomass fuel like wood in a clay stove to cook food. The existing stove designs have create a lot of smoke which is leading to health issues such as asthma, etc.

Objective

Design an affordable and easily manufacturable fuel-efficient stove top that emits less smoke targeting communities in central Nepal.

Challenges

Project location is far from cities, and in a high altitude
Surface temperature of stove must be below 40°C

Constraints

Stove price must stay below \$5 Canadian, or 500 NPR
Materials must be easily accessible in Nepal
Cooking area was considered to be 2ft x 2ft

Manufacturing

Materials

Cob
Firebrick
AISI 1065 Carbon Steel

Manufacturing

Molding and placing: 1 hrs
Mixing materials to create cob: 0.25 hrs

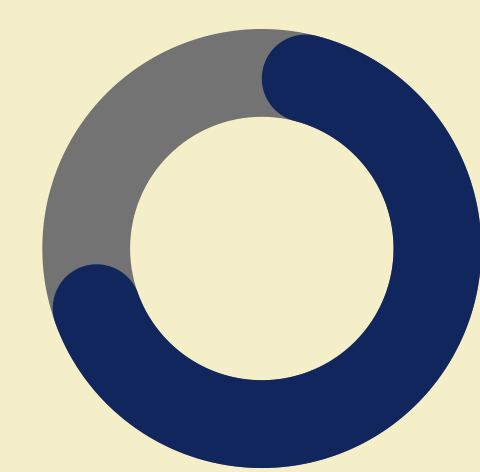


Costs

Material Cost
361 NPR

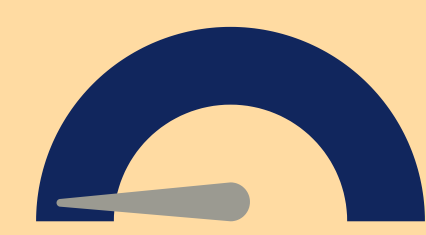
Manufacturing Cost
130 NPR

Full Cost Estimate
491 NPR



Analysis

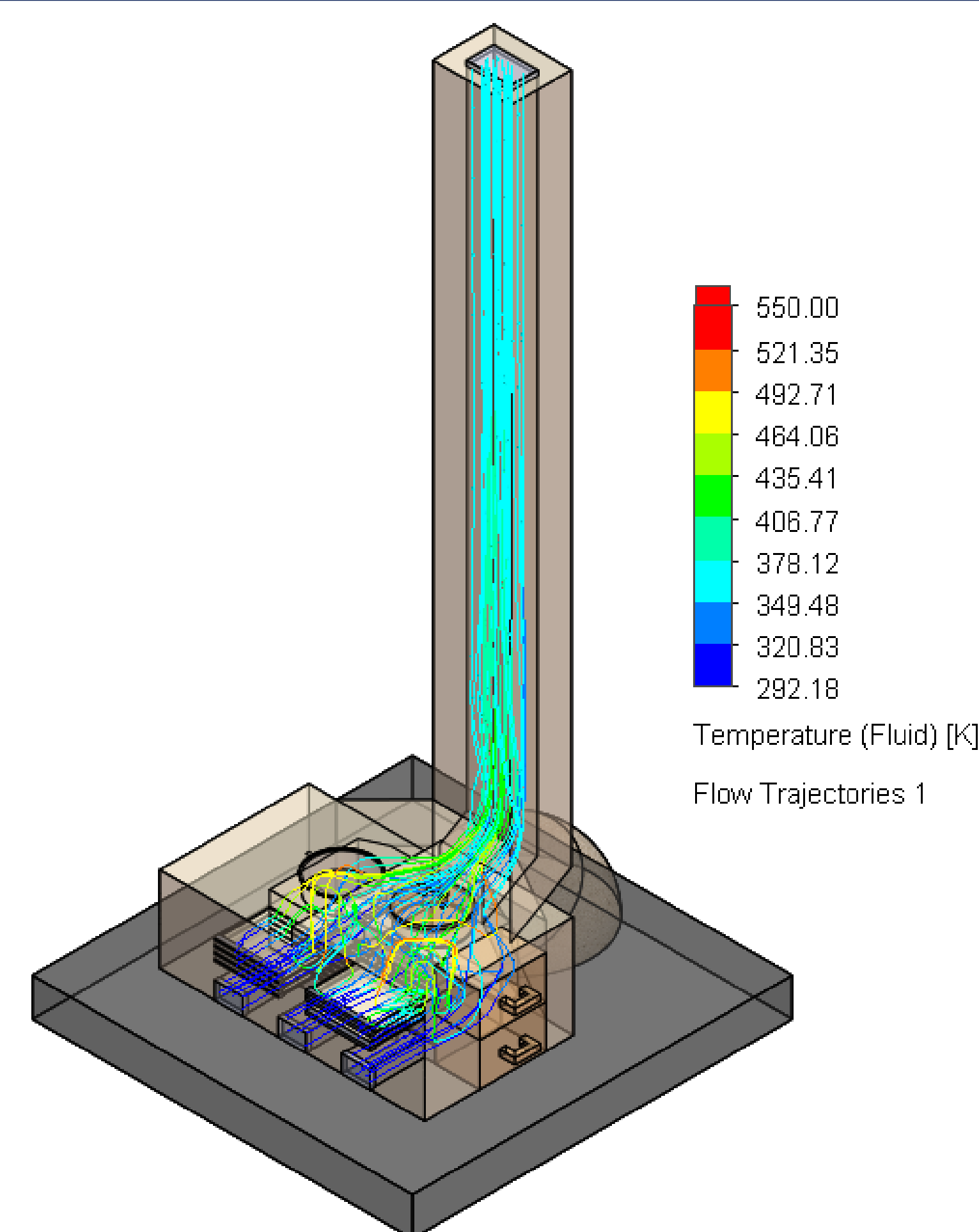
Heat efficiency
= 2.76%



Nepalese fuel consumption
= 6.67 to 13.33
kg/hour



Knack'd Prototype Fuel consumption
= 0.33 to 0.83
kg/hour



Features

Primary air intake allows cool air flow in. This air heats by passing through the flames and continues its flow underneath the burners and through the chimney.

Large chimney exhausts the smoke outside of the house

Burner allows for smoke to directly flow underneath the pan for cooking

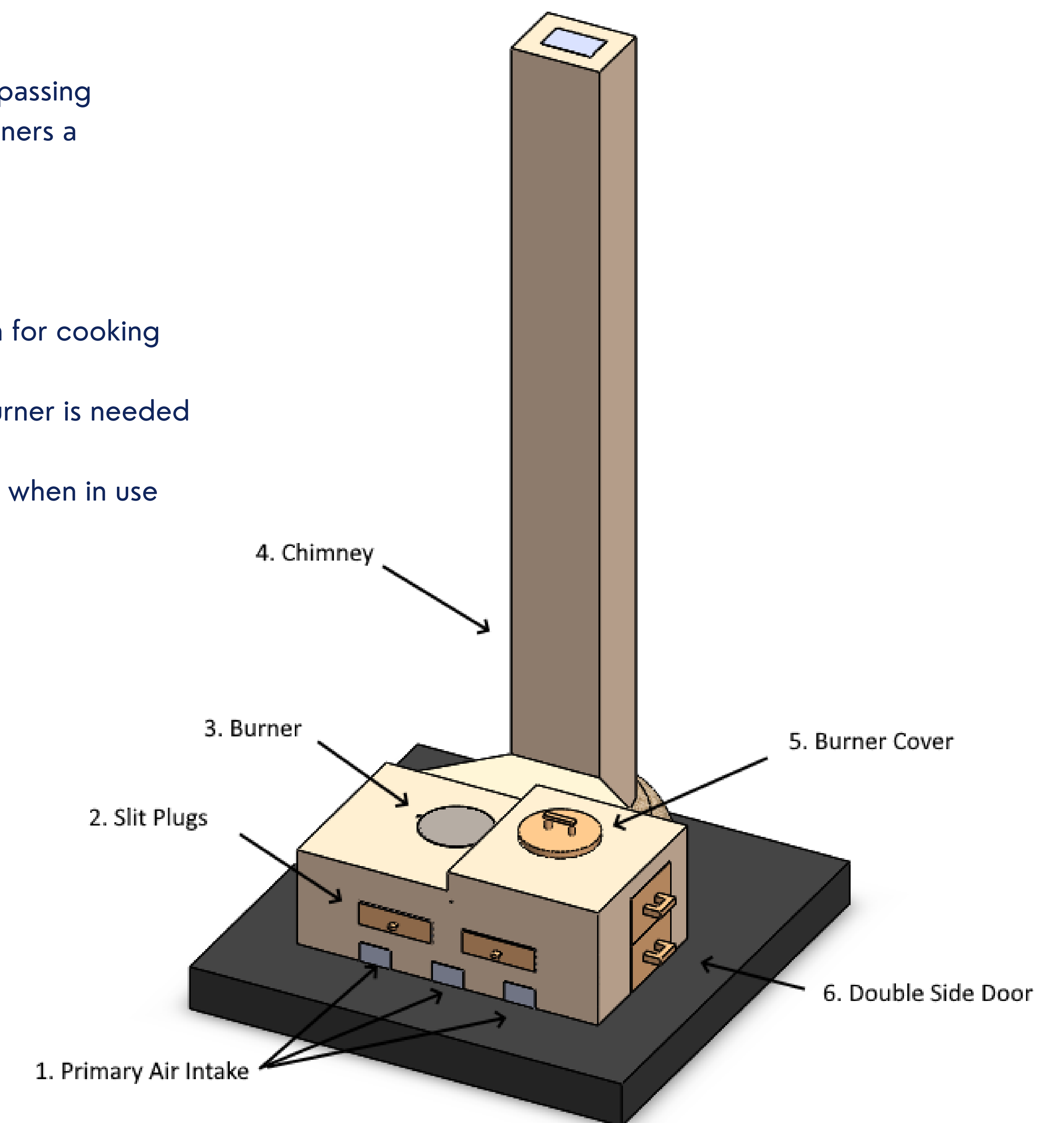
Burner Cover seals the unused burner whenever a single burner is needed

Side Door prevents the smoke from escaping into the house when in use

Slits allow light from the flames to illuminate the room.

Slit plug allows slits to be sealed as needed

Grate holds the wood above the air intake



Results

Stove dimensions meets physical threshold
Stove is designed to be functional for a minimum of 10 years

2 burners 0.203 m in diameter: Frying and boiling
Heat produced is adjustable while cooking
Stove emits light for illumination
Fuel-to-burner efficiency fails to meet the 75% goal
Interior of the stove is reachable for cleaning and maintenance
Simulated Burner Surface Temperature is 252 °C

Cost per unit is less than 500 NPR
Stove is easily locally manufacturable and repairable
Stove follows the Nepalese standard NICB 2016

Outer surface temperature does not exceed 48°C
Smoke emission to user is minimized including while refueling

