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import pandas as pd

material_data = {
    "Virgin Polyester": {"EF": 9.52},
    "rPET": {"EF": 7.23},
    "Organic Cotton": {"EF": 3.5},
    "Conventional Cotton": {"EF": 6.7},
    "Recycled Nylon": {"EF": 4.1},
    "Tencel": {"EF": 2.1}
}

factories_by_region = {
    "India": {
        "India_Factory_1": "Virgin Polyester",
        "India_Factory_2": "Conventional Cotton"
    },
    "China": {
        "China_Factory_1": "Virgin Polyester",
        "China_Factory_2": "rPET"
    },
    "Vietnam": {
        "Vietnam_Factory_1": "Virgin Polyester",
        "Vietnam_Factory_2": "Recycled Nylon"
    }
}

production_volume_kg = 10000

print("Available Regions:")
for region in factories_by_region:
    print(f"- {region}")

region_choice = input("Enter region: ").strip()

if region_choice not in factories_by_region:
    print("Invalid region.")
    exit()

print(f"\nAvailable Factories in {region_choice}:")
for factory in factories_by_region[region_choice]:
    print(f"- {factory}")

factory_choice = input("Enter factory name: ").strip()

if factory_choice not in factories_by_region[region_choice]:
    print("Invalid factory.")
    exit()

current_material = factories_by_region[region_choice][factory_choice]
current_ef = material_data[current_material]["EF"]
current_emissions = round(current_ef * production_volume_kg, 2)

print(f"\nCurrent Material: {current_material}")
print(f"Current Emissions: {current_emissions} kg CO2e for {production_volume_kg} kg\n")

alternatives = [mat for mat in material_data if mat != current_material]
results = []

while True:
    print("Available Alternatives:")
    for alt in alternatives:
        print(f"- {alt}")

    choice = input("Pick an alternative to compare (or type 'Done' to finish): ").strip()

    if choice.lower() == "done":
        break
    if choice not in material_data:
        print("Invalid choice.")
        continue

    alt_ef = material_data[choice]["EF"]
    alt_emissions = round(alt_ef * production_volume_kg, 2)
    reduction = round(current_emissions - alt_emissions, 2)
    percent_reduction = round((reduction / current_emissions) * 100, 1)

    results.append({
        "Region": region_choice,
        "Factory": factory_choice,
        "Current Material": current_material,
        "Alternative": choice,
        "Current Emissions (kg CO2e)": current_emissions,
        "New Emissions (kg CO2e)": alt_emissions,
        "Absolute Reduction (kg CO2e)": reduction,
        "Percentage Reduction (%)": percent_reduction
    })

if results:
    df_results = pd.DataFrame(results)
    print("\nWhat-if Comparison Table:")
    print(df_results.to_string(index=False))

    filename = f"what_if_results_{region_choice}_{factory_choice}.csv"
    df_results.to_csv(filename, index=False)
    print(f"\nResults saved to '{filename}' in your current folder.")
else:
    print("No alternatives were analyzed.")

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