



DIGITAL TRANSFORMATION FOR RESPONSIBLE LAND ADMINISTRATION

FIG Commission 7 & 2 Annual Meeting 2023

2-4 October 2023, Deventer



Drones & Web GIS Based House Addressing System

A case of Changunarayan - An Urbanizing Municipality from Kathmandu, Nepal

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Co-Founder NAXA

- A Geo-ICT Technology consulting company

Co-Founder Nepal Flying Labs

- Localizing Drone Technologies for Social Good

We are a team of **young, diverse, & dedicated professionals** working together to the overall development of Nepal through contributions in **technological innovations** to solve local problems & challenges.



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Existing Practice



Existing Practice



The cake you've ordered is ready.
 Where shall I deliver it Mam?

Please arrive at Shivapuri School and
 take the right turn. It's the fourth house!

Gets confused after reaching
 nearby the place & calls again.

Emergency Services

A house in central KTM has caught fire.
 Call the ambulance ..

- How will it identify the exact location ?
- When will it get here?



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Current Context : Nepal

- ❑ Household Addressing System - Limited Cities only
- ❑ Several businesses have started providing online service delivery
- ❑ No National Framework on Street Naming and Household Addressing
- ❑ Lack of a user interface for general citizens to access the household address in general
- ❑ Lack of Spatial Literacy / Map Literacy among Citizens and All Stakeholders



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Initiative 1:

A study of urban addressing landscape for identification of suitable addressing system for Urbanizing municipalities of Nepal



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	Area-based	Street Metric-based	Street Sequential-based	Plus Code	What3Words	Robocodes
Precision	Low	High	High	Medium	Medium	High
Intuitive	High	High	High	Low	Low	Medium
Scaling	Medium	High	Low	High	High	High
Ease of Adoption	High	High	High	Medium	Medium	Low
Digital adaptability	Low	Low	Low	High	High	High
Relatability	Medium	High	Medium	Medium	Low	Medium
Physical address compatibility	High	High	High	Low	Low	Medium

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Initiative 2 : Drones & Web GIS Based House Addressing System - ChanguNarayan Municipality

(10 Steps Methodology)

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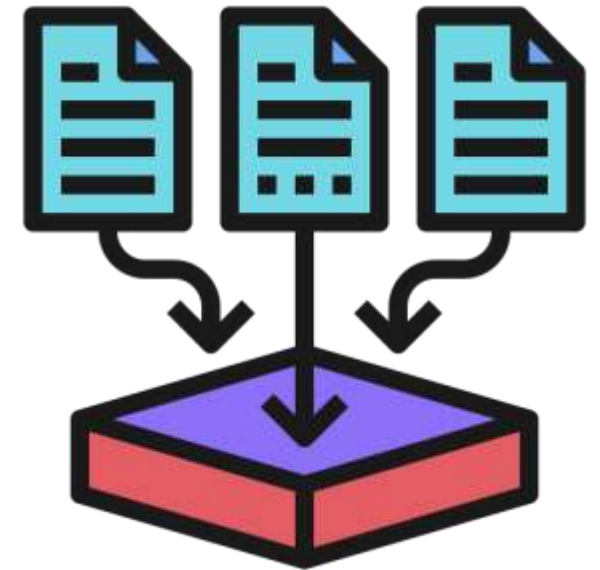
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Step 1 : Secondary Data Collection

- ❑ **Collection of Detailed Household Survey Data -**
 - ❑ DCA, Municipality Survey After Nepal Earthquake and Changuarayan Municipality Household Survey
- ❑ **Collection of Drone Imageries and Orthophoto Maps.**
- ❑ **Collection of Available Reports and Datasets:**
 - MTMP Reports (Transport related study, datasets)
 - IUDP Reports (Urban planning related study, datasets)



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Step 2 : Data Gap Assessment

Data gaps were identified for :

- *Road Networks*
- *Demographic datasets linked to Spatial data features*
- *Building Footprints*
- *Settlement Boundaries , Ward Boundaries etc*



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Step 3 : Data Digitization, Detailing

- Digitization of data layers such as building footprints, road network, ward boundaries and settlement areas in GIS environment.
- Identification of start and end points of road and validated through Participatory Mapping.
- Classification of Roads into three main categories; **Major, Minor and Subsidiary**.



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3.1 Detailing Road Inventory



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Step 4 : Household Survey

- ❑ Preparation of standard set of questionnaires.
- ❑ Use of open source data collection app consisting of drone imagery as base map; ODK Collect
- ❑ Trained local youths for data collection using map and mobile devices.
- ❑ Data verification by validators and supervisors.



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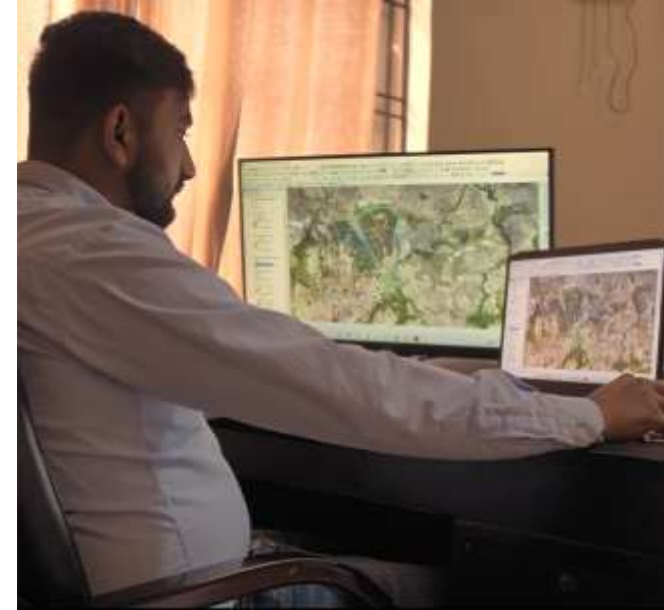


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Step 5 : Survey Data Validation and Update



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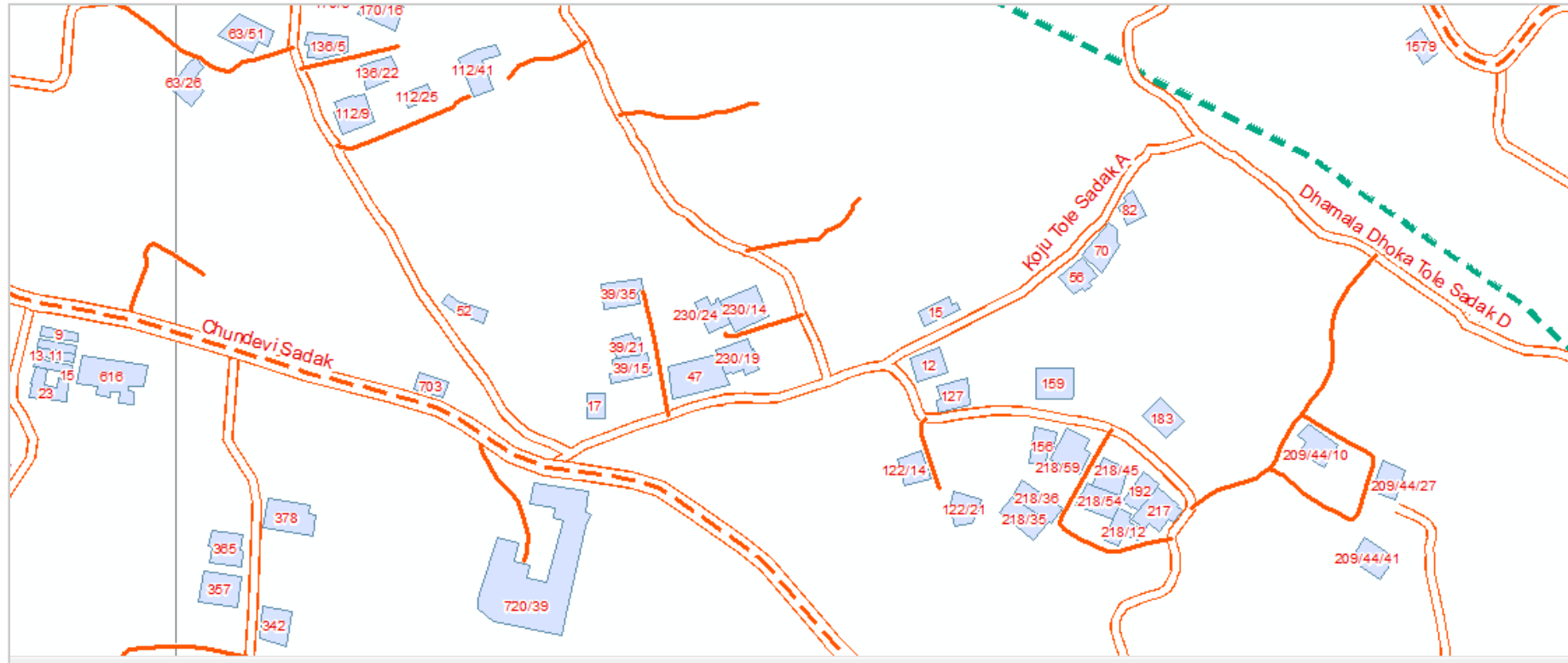


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Step 6 : Generation of House Numbers



**Building with House
 Number : 20,285**

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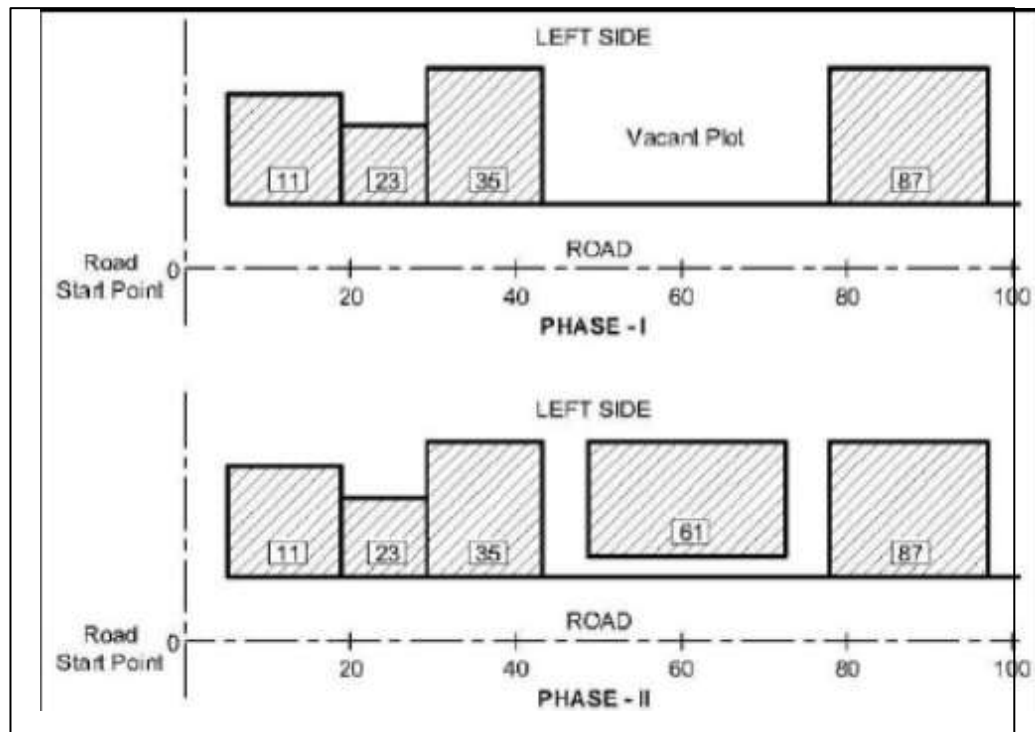


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Each house within the municipality area will have a number, based on its metric distance from the street

Each street will also have a unique name and code to avoid duplication of house numbers.

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CHALLENGES... WHAT NEXT ????

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- How to assign household numbers in case of new buildings?
- How to add new buildings in the building database which are being regularly built?
- How to maintain regular updates of road network?



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SOLUTION

1. Web Based Addressing System
2. Digital Inventory of Road Networks and Building Footprints

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DMAS - *Digital Metric Addressing System*



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The screenshot shows the DMAS (Digital Mapping and Administration System) interface. On the left, there is a search bar and a list of land parcels with columns for parcel number, name, and ward. The main area displays a 3D terrain map with red and green overlays representing different land parcels. A legend in the bottom right corner identifies the colors: Main Building (grey), Accessory Building (light grey), Demolished Building (dark grey), and Main Road (red). Other UI elements include a 'Select Ward' dropdown and a 'Filter by Polygon' button.

Parcel No.	Parcel Name	Ward
48/10	-	0200 Ward 1
790	Sarawati Khat...	Ward 1
803	Sarawati Khat...	Ward 1
335	Buddha Sthan Ma...	Ward 1
161	Shivohari Marg...	Ward 2
723	Sarawati Khat...	Ward 1
651	Sarawati Khat...	Ward 1
159	0200	Ward 1
52	Hogorkal Bada...	Ward 2
33	Hogorkal Bada...	Ward 1
29/9	Sarawati Khat...	Ward 1

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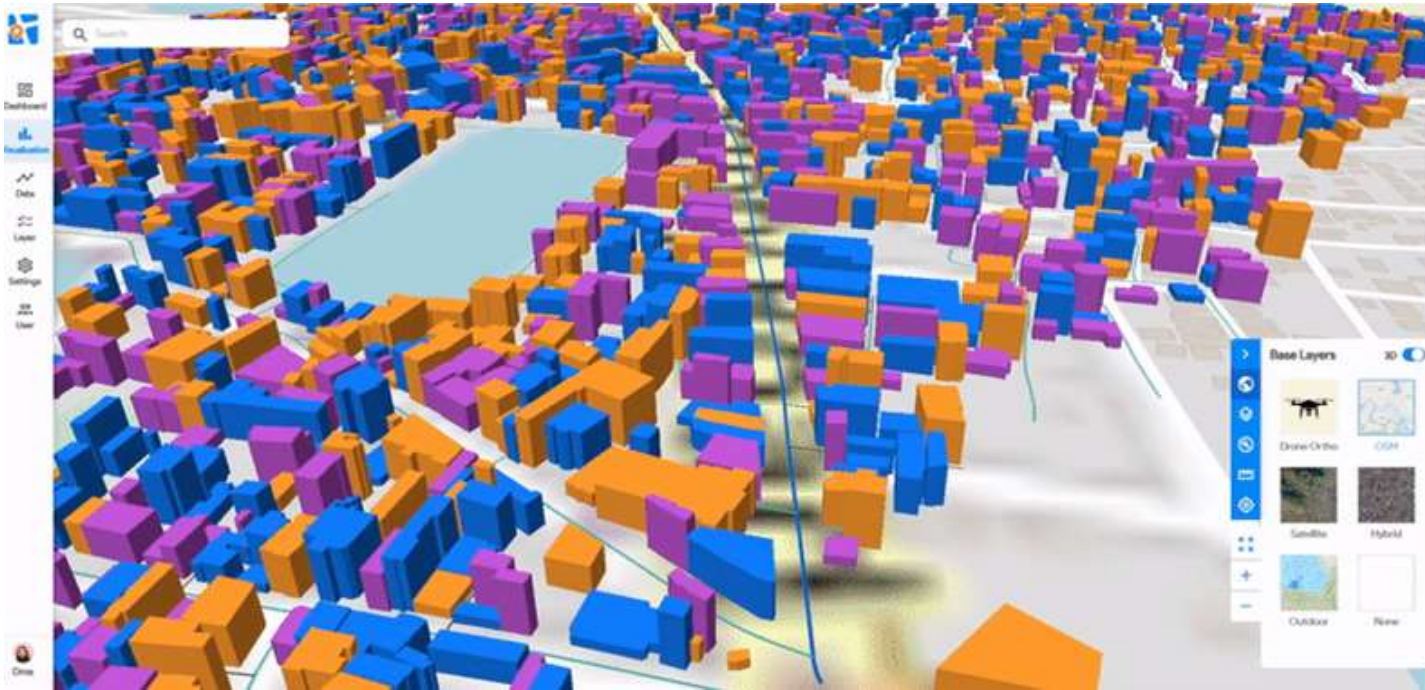


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Access Road

Draw Building
 Draw Data Location
 Select Road Connecting Building
 Other Details
 Owner Name *

 Select Ward *

 Title Name *

 Select Status *

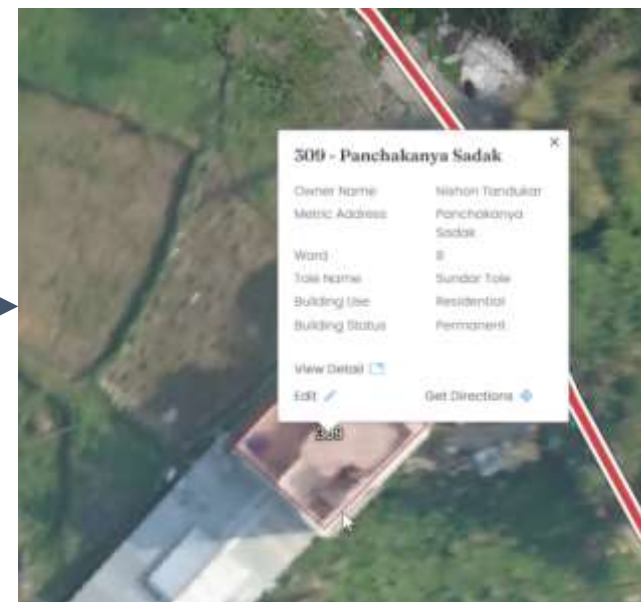
 Select Structure Of Building *

 Select Registration Type *

 Select Usage *

 Building Floor

Building Basic Information



Newly Generated Building Address

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Click to go back, hold to see history

DMAS SA

Map

Data

User Management

Add Road [X]

Road Type: Major

Draw Road On Map
Main house type description here. Main house type description here. Main house type.

Draw Road

Other Details

Save

Select Ward [v] Filter By Polygon

Legend

- Buildings
- Roads

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Draw new roads in road inventory

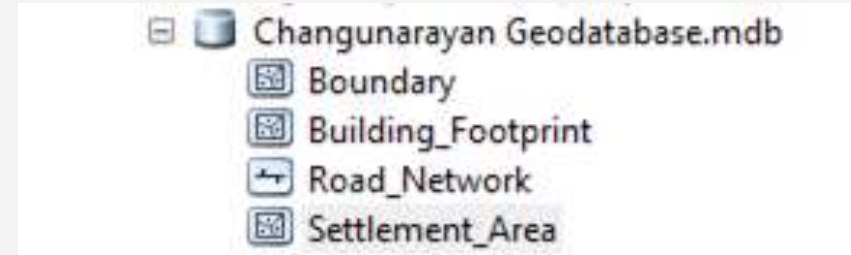


Project Handover



a. High Resolution Drone Imagery

a. Integrated Geodatabase



a. GIS Maps

- Maps displaying house number and road labels for buildings and roads respectively
- Proposed Street Sign Location Map

a. Detailed Report highlighting major outcomes and methodologies

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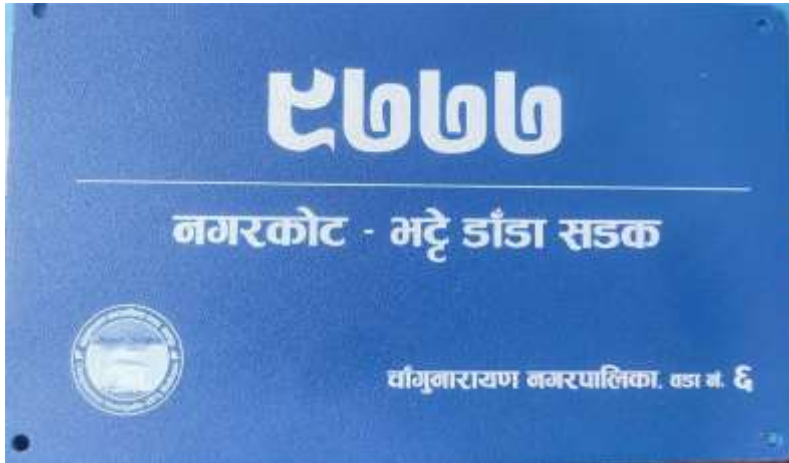


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Installation of Number Plates & Street Signage Boards



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RECOMMENDATIONS

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1. Investment in promotion of the **concept of household addressing** / Enhancement of Map literacy.
2. Mandatory requirement of **House numbers** for all citizens to acquire any municipal services could assist in its **co-existence** in the system.
3. **Household Addressing System** should be interlinked with the individual's personal database to introduce **Municipal Profile , etc.**
4. Link the digital system for **tax and revenue collection, waste management, utility tracking systems,etc**
5. Develop inventories of municipal infrastructure as we go along

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THANK YOU

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