PROTECTING HADERA CITY FROM FLOODING
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HADERA STREAM BEFORE ENTERING THE CITY
Israel area ~ 22,000 km² (8,500 mi²)
California area ~ 164,000 mi²
San Diego ~ 4,500 mi²

Population Density
395/km² (1000/mi²) – 600/km² (1540/mi²).
235/mi² in California.
ISRAEL AS A UNIQUE CASE-STUDY

- Land owners – majority belongs to the State
- Water owners – Runoff, streams, groundwater – belongs to the State
- Climate – Mediterranean, Semi-arid, Arid (Prone to climate change)
- Fertility rate – Highest in the OECD (3.1 Israel, 2 in usa)
- Streams – Ephemeral (Kishon is perennial)
- Drainage Authorities – Catchment Based Bodies
- Agriculture – Field crops, orchards, intensive, green houses
- Irrigation – Mostly treated wastewater and fresh (desalinated, flood, groundwater)
ISRAEL MINISTRY OF AGRICULTURE

DRAINAGE AND SOIL CONSERVATION DEPARTMENT

Erosion – lower Galilie

Shizafim basin
Protecting urban settlements

Jordan river
Protecting agriculture

Protecting agriculture

Protecting urban settlements
DRAINAGE AUTHORITIES

• Statutory organizations operating under the law of drainage and flood protection, 1957.
• Since 1997 - 11 drainage authorities cover all Israel, divided by river basins.
• Financial Sources:
  – Drainage quota
  – Designated budgets
TOPOGRAPHY – HEIGHTS MAP

Hadera stream
The Hadera stream is one of the largest of Israel's coastal streams, 55 km (35 mi) long; its catchment area includes 600 km$^2$ (230 mi$^2$).
After crossing mountain area, the Hadera stream crosses Hadera city and ends at the Israeli Mediterranean coast.
Population: 1850/ km$^2$ (4750/mi$^2$) urban area. Massive building projects are increasing the run-off water volume and covering land surface.
2013 HADERA FLOODING – PAPER FACTORY
1% flood plain
Zoom in on Hadera city area, looking at different flood probability rain incidents
Before 2013 – the stream carried 180 m³/sec (47,000 ga/sec).
Today – it’s planned to carry 350 m³/sec (92,000 ga/sec).

Massive construction being done as we speak.
AND YET, THIS IT NOT ENOUGH
Increasing capacity

Retaining area 24 million m$^3$ (6000 million ga)

The plan
CHALLENGES

• How to define an area, which is already flooded, but now becoming statutorily planned?
• This is an agriculture land, it can’t be closed with fences, who is responsible, in terms of security?
• How to condensate the farmers?
To be continued...