# Istanbul Baraj Projesi - Guncel Durum ve Detayli Cikti Raporu

## Kapsam ve Amac

Bu rapor, Istanbul baraj doluluk projesinin guncel durumunu, veri katmanlarini, model gelistirme turlarini, test sonuclarini, projeksiyon ciktilarini ve acik veri bosluklarini detayli sekilde ozetler.

## Veri Katmanlari (Secili Ozetler)

- newdata_feature_store: na -> na (na ay)

- Resmi sehir suyu: 2010-01-01 -> 2023-12-01

- Reanalysis proxy: 1940-01-01 -> 2026-03-10

- Aylik operasyon proxy (transfer/NRW/geri kazan■m): na -> na

## Model Gelistirme Turlari

### Round 3 Ozet

| family | model | rmse_pp | mape_pct | pearson_corr_pct | status |
|---|---|---|---|---|---|
| extra_param | hybrid_physics_stacked_exog | 6.503846339208616 | 9.60215431087286 | 94.23514290816472 | kept |
| extra_param | quantile_regressor_plus | 7.781408402610931 | 9.859026669987475 | 91.4027488985479 | candidate |
| extra_param | hybrid_physics_ensemble_phys_old | 7.773890522819784 | 10.474449077252649 | 93.24176889774876 | candidate |
| extra_param | water_balance_v4_corrected | 8.703889909998326 | 11.551826571743634 | 94.43183531111052 | candidate |
| extra_param | prophet_regressor_exog | 7.966651483144593 | 11.981889035453278 | 92.01865454741468 | candidate |
| water_balance_exog | water_balance_v5_exog | 11.768243829381184 | 18.06199286469579 | nan | rejected |

### Round 4 Ozet

| artifact | status | rmse_pp | mape_pct | pearson_pct | note |
|---|---|---|---|---|---|
| monthly_operational_proxies | kept | nan | nan | nan | Aylik transfer/NRW/reclaimed proxy tablosu uretildi v |
| stacked_exog_ops | kept | 6.580649091139963 | 9.523445322804566 | 94.21532642248675 | Ops proxy sonrasi sonuc |
| quantile_ops_best | kept | 7.781408402610931 | 9.859026669987475 | 91.4027488985479 | Ops proxy sonrasi sonuc |
| prophet_ops_allproxy | rejected | 17.96326300551316 | 24.921312563486534 | 61.87548387471165 | Ops proxy sonrasi sonuc |
| water_balance_v6_ops_curve | rejected | 11.363206918641266 | 15.409930326322003 | 92.3282992532975 | Aylik transfer/NRW + alan-hacim egri vekili eklendi; p |
| prophet_subset_search_best | kept | 7.966651483144593 | 11.981889035453278 | 92.01865454741468 | En iyi Prophet hala src_rain_north tek ek regressor. |
| quantile_subset_search_best | kept | 7.781408402610931 | 9.859026669987475 | 91.4027488985479 | En iyi Quantile hala base boosted median. |

## Holdout Test Sonuclari (2016-2020)

| model | rmse_pp | mae_pp | mape_pct | smape_pct | pearson_corr_pct | spearm |
|---|---|---|---|---|---|---|
| hybrid_physics_stacked_exog | 6.580649091139963 | 5.311002662707452 | 9.523445322804566 | 10.043801978804352 | 94.21532642248675 | 95.5043 |
| quantile_regressor_plus | 7.781408402610931 | 5.9008026283590285 | 9.859026669987475 | 9.976279907648932 | 91.4027488985479 | 90.6751 |
| hybrid_physics_ensemble_phys_old | 7.773890522819784 | 6.000657070913325 | 10.474449077252649 | 9.828667957597132 | 93.24176889774876 | 93.4661 |
| water_balance_v4_corrected | 8.703889909998326 | 6.897782747074565 | 11.551826571743634 | 10.730825184658974 | 94.43183531111052 | 94.6033 |

| prophet_regressor_exog | 17.96326300551316 | 14.358897954591082 | 24.921312563486534 | 27.71533796937452 | 61.87548387471165 | 61.0502 |

## 2040 Sonu Baz Senaryo Uc Degerleri

| model | pred_fill | pred_fill_pct |
|---|---|---|
| hybrid_physics_stacked_exog | 0.1492568561494105 | 14.92568561494105 |
| hybrid_physics_ensemble_phys_old | 0.3578001102160605 | 35.78001102160605 |
| water_balance_v4_corrected | 0.029021234582677 | 2.9021234582677056 |
| quantile_regressor_plus | 0.4764826421385766 | 47.648264213857665 |
| prophet_regressor_exog | 0.391468949390547 | 39.1468949390547 |

## 2040 Sonu Baz Senaryo Uc Degerleri

| model | pred_fill | pred_fill_pct |
|---|---|---|
| hybrid_physics_stacked_exog | 0.1492568561494105 | 14.92568561494105 |

# MAPE 5 ve Agresif Aramalar

## Kisa vadeli direct arama (MAPE 5 hedefi) ozeti

| model | rmse_pp | mae_pp | mape_pct | smape_pct | pearson_corr_pct | spearman_cor |
|---|---|---|---|---|---|---|
| evo_direct_level_exog_blend | 4.898806673277172 | 3.2729485823161952 | 5.617946651410206 | 5.610397597107901 | 96.43813167915712 | 95.548763545 |
| gbr_d2_lr002 | 5.835730868647406 | 4.459084450438441 | 7.972740485690652 | 7.593334811226747 | 96.43813167915712 | 95.548763545 |
| gbr_d3_lr0015 | 5.937048324227103 | 4.458547130020621 | 8.390930516034897 | 7.849258430117942 | 96.12766056588434 | 94.848569046 |
| et_mid | 5.887215651848968 | 4.720859389190134 | 9.11386601884326 | 8.448476570419615 | 96.57152450606982 | 95.520978049 |
| et_deep | 6.019703275706171 | 4.802070785316378 | 9.2834152990556 | 8.59882428254586 | 96.32190153214977 | 95.226451792 |
| hgbr_mid | 6.917888051989912 | 5.369229318895122 | 9.591472958121193 | 9.18850586629846 | 93.57293051836812 | 92.570158377 |
| catboost_d4_lr003 | 6.103881647774073 | 4.795158555150639 | 9.909095907308489 | 8.955019336016942 | 97.68090869725783 | 96.732425673 |
| catboost_d4_lr002 | 6.509189053352535 | 5.075015754072004 | 10.571272650410764 | 9.466119510775805 | 97.68502640670744 | 96.460127813 |
| catboost_d5_lr002 | 6.852003459064616 | 5.4120823259857875 | 11.10418084642938 | 9.942092456956717 | 97.35709340062468 | 95.793275909 |
| catboost_d6_lr015 | 7.904935784760711 | 6.261104291300097 | 12.930757983201197 | 11.401229874915678 | 96.42212554795806 | 94.248402333 |

## Agresif direct-level arama ozeti

| model | mode | rmse_pp | mape_pct | pearson_corr_pct | end_error_pp | weights |
|---|---|---|---|---|---|---|
| catboost_level_a | direct_level | 6.204342679659403 | 10.062073495230472 | 97.5127604388305 | 12.316534648848492 | nan |
| catboost_level_b | direct_level | 6.003235172077312 | 9.558993219068284 | 97.07246023724696 | 10.744310328163149 | nan |
| evo_direct_blend | direct_level_blend | 4.878949043939169 | 5.481746572075834 | 96.6731540355139 | 1.8408565841451672 | {"catboost_level_a": 0.0, "catb |
| gbr_level_a | direct_level | 5.727779987972274 | 8.013201988604271 | 96.63255629134947 | 6.048832591906023 | nan |
| gbr_level_b | direct_level | 6.030107455426227 | 8.780824874669541 | 96.62668901386536 | 6.673767520344481 | nan |
| et_level_a | direct_level | 5.763626892306366 | 8.882627621218662 | 96.56908782922274 | 12.07747823416489 | nan |
| hgbr_level_a | direct_level | 6.5834195981574615 | 9.500651280536454 | 94.6022972659678 | 9.453398771012706 | nan |

# Water-Balance Retry (Round 5)

| model | rmse_pp | mape_pct | pearson_pct | base_2040_pct | decision |
|---|---|---|---|---|---|
| water_balance_v4_corrected | 8.70389 | 11.551827 | 94.431835 | 2.902123 | baseline_wb_best_so_far |
| water_balance_v6_ops_curve | 11.363206918641266 | 15.409930326322003 | 92.3282992532975 | 6.213523530421872 | reject |
| water_balance_v7_ops_residual | 10.631368325062382 | 13.778137277006728 | 93.16868103216356 | 28.96952858814955 | reject_but_less_bad_than_v6 |

# Model Ilerleme Ozeti

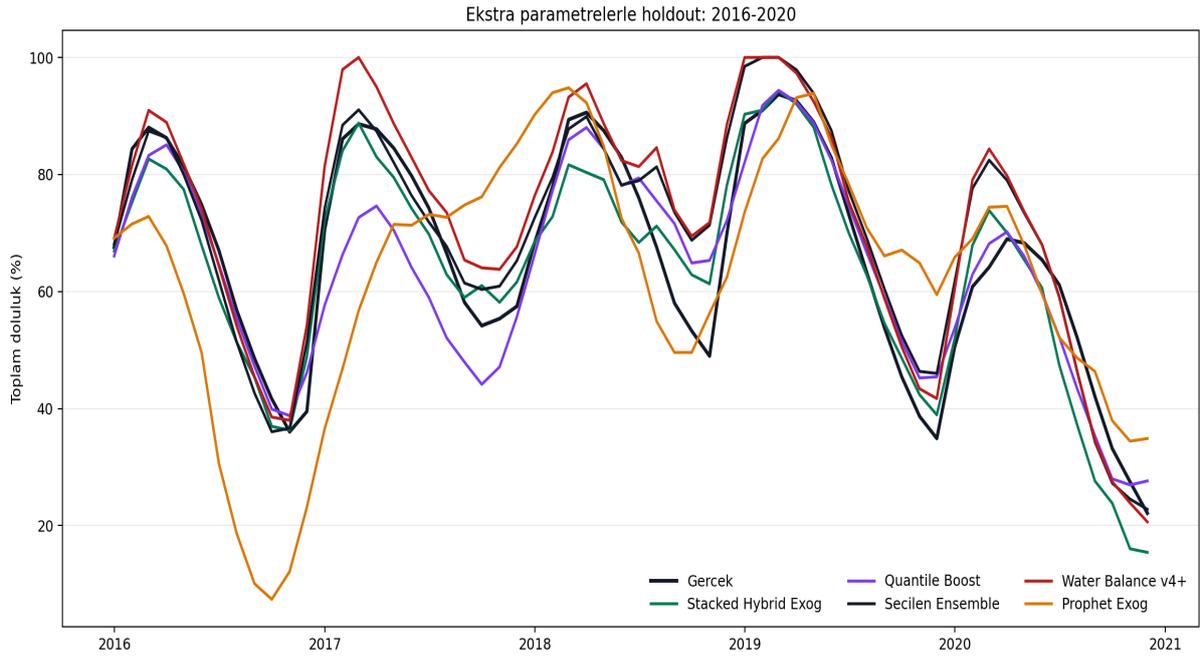| family | old_model | new_model | old_mape_pct | new_mape_pct | mape_delta_pct | old_rmse_ |
|---|---|---|---|---|---|---|
| Stacked Hybrid | hybrid_physics_stacked_plus | hybrid_physics_stacked_exog | 9.525550099014009 | 9.60215431087286 | 0.0766042118588519 | 7.0903390 |
| Prophet | prophet_regressor_plus | prophet_regressor_exog | 13.001733381808132 | 11.981889035453278 | -1.0198443463548532 | 10.664025 |
| Quantile | quantile_regressor_plus | quantile_regressor_plus | 9.859026669987475 | 9.859026669987475 | 0.0 | 7.7814084 |

# Ana Cikti Klasorleri

- output/final_delivery/istanbul_baraj_final_paket - output/istanbul_models_extra_params_2026_03_12 - output/istanbul_mape5_push_and_longhorizon_2026_03_12 - output/istanbul_aggressive_model_search_99_2026_03_12 - output/istanbul_preferred_projection_2040 -
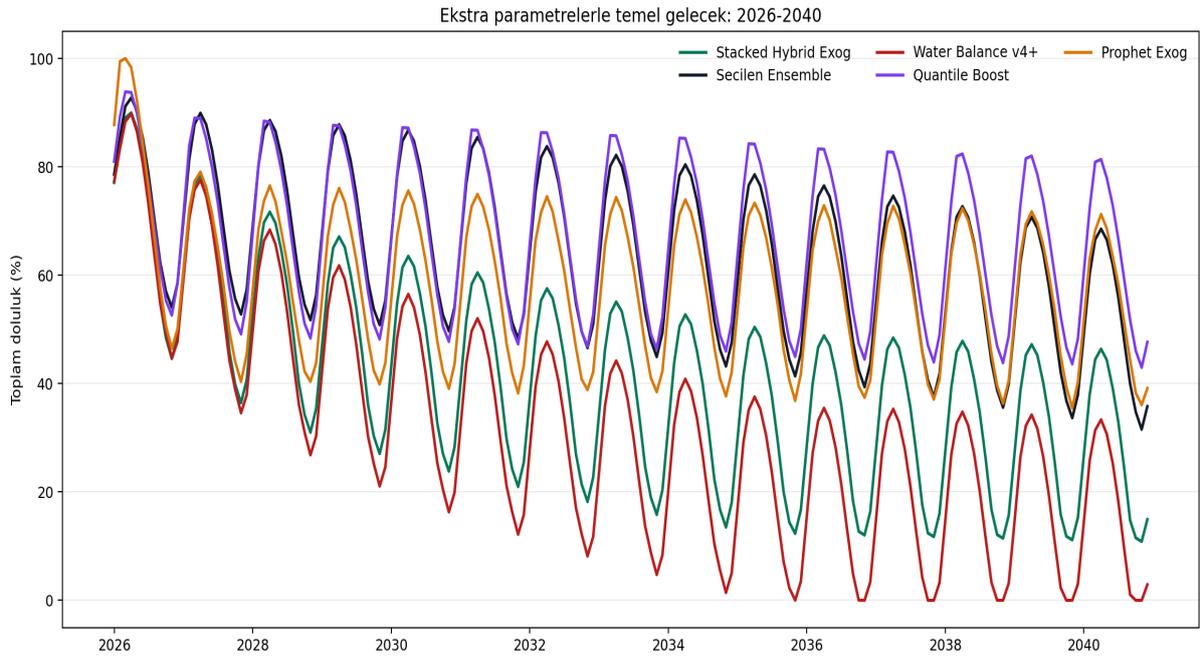
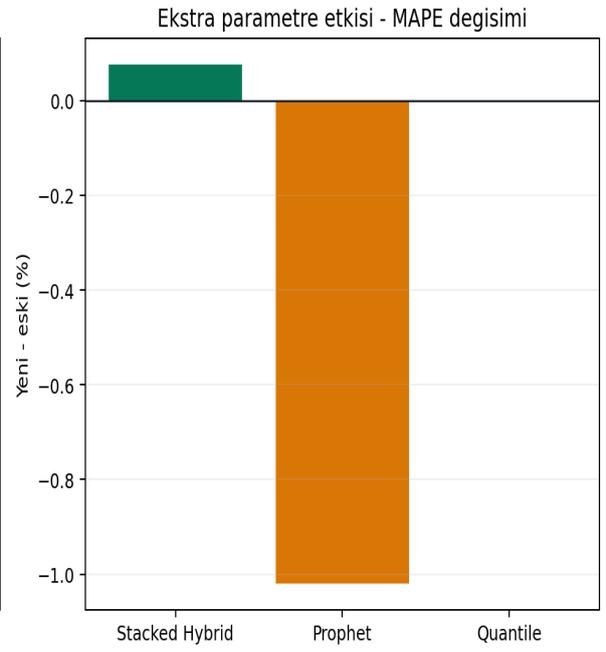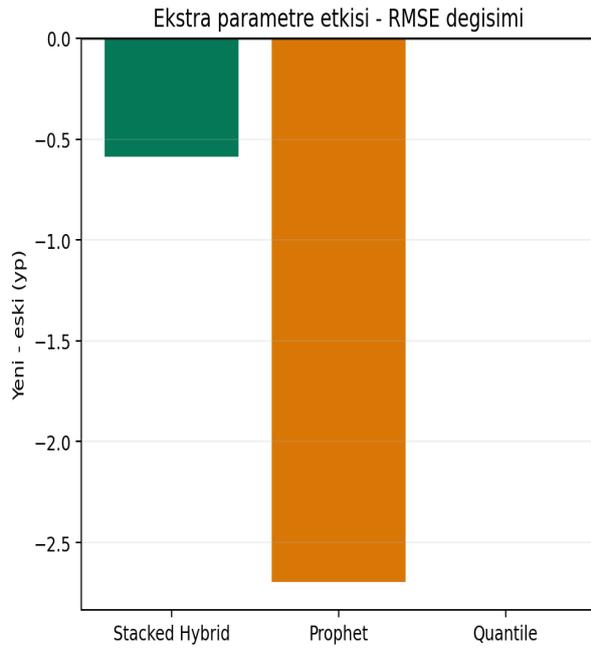output/istanbul_preferred_operational_risk_2030

# Gorseller

Gorsel: extra_param_models_holdout.png



Ekstra parametrelerle holdout: 2016-2020

Gorsel: extra_param_models_future.png



Ekstra parametrelerle temel gelecek: 2026-2040

Gorsel: extra_param_improvement_vs_previous.png

Ekstra parametre etkisi - RMSE degisimi

Ekstra parametre etkisi - MAPE degisimi

Gorsel: aggressive_direct_level_top_models.png



Agresif arama - en iyi direct level modeller