Table S1. Equations of the vegetation dynamic model components. Parameters are defined in Table

Ecophysiological term	Equations
Biomass components	$\frac{dB_g}{dt} = a_a P_g - R_g - S_g$ for both tree and grass $\frac{dB_s}{dt} = a_s P_g - R_s - S_s$ for both tree and grass $\frac{dB_r}{dt} = a_r P_g - R_r - S_r$ for both tree and grass $\frac{dB_d}{dt} = S_g - L_a$ for tree only where B_g, B_s, B_r, and B_d are the green leaves, stem, living root, and standing dead biomass compartments, respectively, P_g is the gross photosynthesis, a_a, a_s and a_r are allocation coefficients to leaves, stem and root compartments ($a_a+a_s+a_r=1$), R_g, R_s and R_r are the respiration rates from leaves, stem and root biomass, respectively, S_g, S_s and S_r are the senescence rates of leaves, stem and root biomass, respectively, and L_a is the litter fall
Photosynthesis	$P_g = \varepsilon_P(PAR) f_{PAR} PAR \frac{1.37r_a + 1.6r_{c,min}}{1.37r_a + 1.6r_c}$ $\varepsilon_P(PAR) = a_0 + a_1 PAR + a_2 PAR^2$ $f_{PAR} = 1 - e^{-k_e LAI}$
Allocation	For tree $a_a = \frac{\xi_a}{1+\Omega[2-\lambda-f_1(\theta_j)]}$; $a_s = \frac{\xi_s+\Omega\lambda}{1+\Omega[2-\lambda-f_1(\theta_j)]}$; $a_r = \frac{\xi_r+\Omega(1-f_1(\theta_j)}{1+\Omega[2-\lambda-f_1(\theta_j)]}$ $\lambda = e^{-k_e LAI}$; $\xi_a + \xi_s + \xi_r = 1$ For grass $a_a = \frac{\xi_a+\Omega\lambda}{1+\Omega[1+\lambda-f_1(\theta_s)]}$; $a_r = \frac{\xi_s+\Omega(1-f_1(\theta_s)}{1+\Omega[1+\lambda-f_1(\theta_s)]}$; $\xi_a + \xi_r = 1$
Respiration	$R_g = m_a f_4(T) B_a + g_a[a_{as} P_{g,s}\, \xi_t + a_{ar} P_{g,r}(1-\xi_t)]$; $R_s = m_s f_4(T) B_s + g_s[a_{ss} P_{g,s}\, \xi_t + a_{sr} P_{g,r}(1-\xi_t)]$; $R_r = m_r f_4(T) B_r + g_r[a_{rs} P_{g,r}\, \xi_t + a_{rr} P_{g,r}(1-\xi_t)]$; $f_4(T) = Q_{10}^{Tm/10}$ with T_m = mean daily temperature
Senescence	$S_a = \delta_a B_a$; $S_s = \delta_s B_s$; $S_r = \delta_r B_r$
Litterfall	$L_a = k_a B_d$
Leaf area index	$LAI = c_g B_g$; $LAI_d = c_d B_d$ where LAI and LAI_d are the green and dead leaf area index
Net CO_2 flux	$F_c = f_t F_{c,t} + f_g F_{c,g} + R_{bs}$; $F_{c,t} = P_{g,t} - R_{g,t}$; $F_{c,g} = P_{g,g} - R_{g,g}$; $R_{bs} = R_{10} Q_N^{\frac{T_m - 10}{10}}$

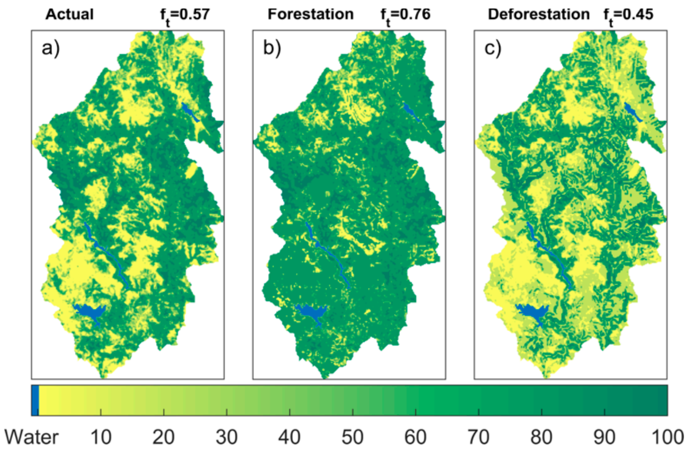

Figure S1. Land cover change scenarios: maps of the fraction of tree vegetation for the: a) actual basin state; b) the afforestation scenario; and c) the deforestation scenario. The fraction of tree cover (ft) is reported for each map.

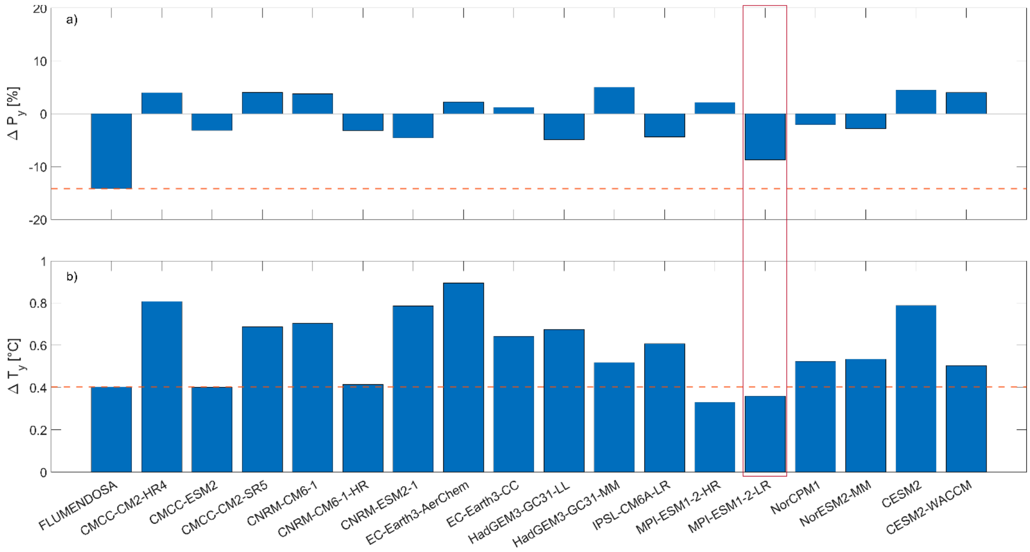

Figure S2. The comparison of 17 Global Climate Models (GCMs) historical predictions with the historical time series of yearly precipitation (Py) and air temperature (Ty). The mean annual variation of the two variables for the period 1983-2014 are compared to the period 1950-1982.

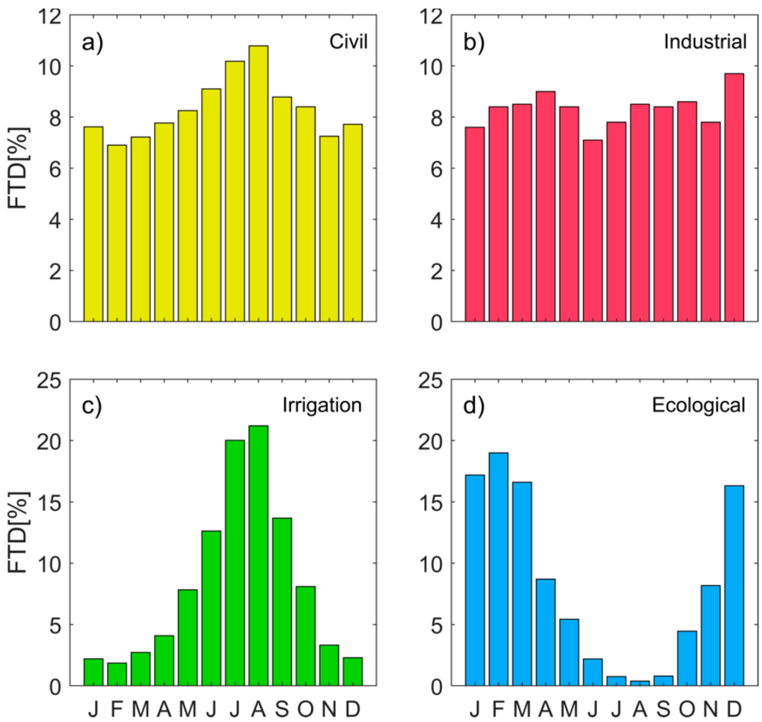

Figure S3. Mean monthly water demands in the Flumendosa dam system for civil, industrial, irrigation and ecological uses.